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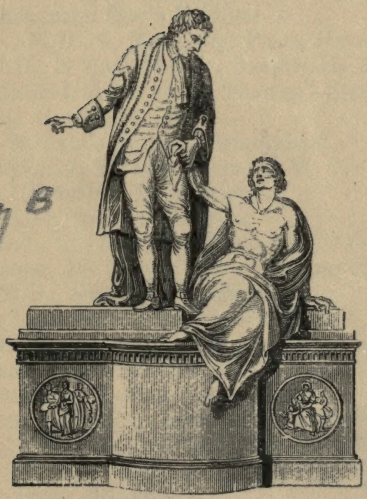

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CONTENTS.

PAGE

I. Report of 72 Cases of Tetanus occurring in Guy's Hospital since the year 1825; by ALFRED POLAND 1

II. On Purpura, and its connection with Splenic Disease; by S. O. HABERSHON, M.D. 89

III. Anatomical description of a Double Fœtus; by S. O. HABERSHON, M.D. 116

IV. Select Surgical Cases—Tracheotomy for Foreign Bodies in the Larynx—Injuries to Veins—Extravasation of Urine in Children; by J. COOPER FORSTER 123

V. Remarks upon some of the Specimens of Diseases of the Bone contained in Guy's Museum, especially those styled Osteo-Sarcoma and Myeloid, with reference to the question of Malignancy; by S. WILKS, M.D. 143

VI. On the Treatment of Purulent Ophthalmia; by J. F. FRANCE 179

VII. On some Ophthalmic Cases, including Organic Disease of the Globe; by J. F. FRANCE 193

VIII. Cases of Idiopathic Fatty Degeneration, with Remarks on Arcus Senilis; by S. WILKS, M.D. 203

IX. On the Causes of Death after Lithotomy; by THOMAS BRYANT 222

X. Cases of Retention of the Menses, relieved by Puncture through the Rectum; by H. OLDHAM, M.D. . . . 244

XI. Cases of Disease of the Pulmonary Artery and its Valves; by G. WHITLEY, M.D. 252

XII. On Abscess of the Brain, with Cases; by W. W. GULL, M.D. 261

XIII. Case of Paraplegia, from Obstruction of the Abdominal Aorta; by W. W. GULL, M.D. 311

XIV. Contributions to the Practical Surgery of New Growths or Tumours—Series I, Cancer; by JOHN BIRKETT . . 315

PAGE

XV. Description of Wax Models in Guy's Museum, representing Roseola Cholerica, and Roseola Variolosa; by the CURATOR . 341

XVI. Case in which a Urethro-Vesical Calculus was removed; by ALFRED POLAND 351

XVII. Notes on Cases of Black Urinary Precipitate; by H. M. HUGHES, M.D. 361

XVIII. Sequel of a Case of Successful Trephining of the Skull for Rupture of Meningeal Artery; by EDWARD COCK . 364

XIX. On Poisoning by Tartarized Antimony, with Medico-Legal Observations on the Cases of Ann Palmer and others; by by ALFRED S. TAYLOR, M.D. F.R.S. 369

XX. On the Detection of Absorbed Strychnia, and other Poisons; by ALFRED S. TAYLOR, M.D. F.R.S. 482

List of Pupils who have passed the several Medical Examining Boards 503

List of Pupils who have received Appointments at Guy's Hospital 507

Subject for the sixth Triennial Prize, 1859 514

LIST OF PLATES AND WOODCUTS.

TO FACE PAGE

Dr. Habershon.

Plate I. Front and back view of a double fœtus . . 122

Plate II. Drawings of dissections of same . . 122

Fig. 1. General arrangement of the circulation.

Fig. 2. Digestive apparatus.

Fig. 3. Imperfect alimentary canal.

Dr. Wilks.

Plate III and IV 178

Fig. 1—9. Myeloid tumours of different bones.

Fig. 10. Osteoid cancer of knee.

Fig. 11. Carcinoma of fibula.

Fig. 12. Osteosarcoma of tibia.

Mr. France.

Plate V 202

Fig. 1. Tumour of the globe.

Fig. 2. Melanotic cancer.

Fig. 3. Tumour of the globe.

Dr. Whitley.

Plate VI. Enlargement of the pulmonary artery . . 2

Plate VII 260

Fig. 1. Pulmonary valves covered with vegetations.

Fig. 2. Pulmonary valves destroyed by disease.

Dr. Gull.

Woodcuts—

Microscopic appearances of cheesy concretion from tympanum 289

Microscopic structure of purulent cyst in brain . 301

TO FACE PAGE

Dr. GULL.

PLATE VIII 314

Fig. 1. Chest and abdomen of man, exhibiting the enlarged tortuous arteries on the surface from obstructed aorta.

Fig. 2. The back view of same.

Mr. POLAND.

WOODCUTS—Fig. 1 to 8. Outlines of urethro-vesical calculi . 356-9

PLATE IX 360

Fig. 1. Sketch of bladder and prostate, with the calculus in position.

Fig. 2. Urethro-vesical calculus.

REPORT

OF

SEVENTY-TWO CASES OF TETANUS

OCCURRING IN GUY'S HOSPITAL SINCE THE YEAR 1825.

By ALFRED POLAND.

The following facts have been collected and compiled from the extant records still remaining within the hospital walls.

These do not, probably, embrace the whole number of cases which have actually occurred, but they enable us to give a very fair average and proportion of the comparative frequency of the disease in a large hospital in London.

Some of the cases have been already published, and placed among the collections of Curling, Lawrie, the 'Lancet,' and the 'Medical Times and Gazette.' These are but few in number, and reappear in the present tables.

The Report has been issued mainly for the purpose of assisting the already existing excellent records and investigations on the subject, but more especially for enabling us to compare, by placing side by side, the several important points of the separate collections of all cases occurring in certain hospitals during a given period.

Mr. Peat[1] and Dr. Morehead[2] have given some detail of the cases in the Sir Jamsetjee Jejeebhoy Hospital, at Bombay.

Dr. Lawrie[3] has recorded all the cases in the Glasgow Infirmary since the year 1794.

[1] Mr. Peat's Paper on 'Tetanus:' 1st No. of the 2d series of 'Trans. of Med. and Phys. Society of Bombay.'

[2] Dr. Morehead, 'Clinical Researches on Disease in India,' vol. ii, p. 621.

[3] Dr. Lawrie's 'Clinical Notes'—Statistics of Tetanus: 'Glasgow Medical Journal,' vol. i, p. 339, 1853-4.

And we have here brought under notice all the recorded cases in Guy's Hospital since the year 1825.

Our Report is by no means complete and satisfactory in every detail of the disease and in every phase of its consideration, inasmuch as many of the important points have been meagerly reported, and some altogether and entirely unrecorded; however, the general mass of material collected has been considered of sufficient interest and merit to warrant a place in the 'Guy's Hospital Reports.'

Every recorded case can be strictly and authentically relied upon, so that perfect confidence may be placed in any deductions that may be drawn therefrom. The cases are not selected—an important point to be borne in mind, as recorded cases, generally, are those only having a successful issue.

It has been suggested, not to occupy our pages by a prolix detail and recital of the full report of each individual case; hence the chief points only for consideration are those mentioned.

The following is a concise statement of all the cases of tetanus occurring in Guy's Hospital since the year 1825; these are arranged according to the order of their occurrence in the several years, and embrace the sex, age, constitution, habits, previous ailments or injuries; the supposed cause and period of accession thereafter; the date, and state of the weather at the time of the seizure; the state of the winds on the day and two preceding days of the attack, marked by initial letters in the same order; the temperature at and before the date, taking the lowest to the highest range during the periods; the state of the wound at the time; any peculiarity in the symptoms; the treatment; the duration; result; and mode of dying; and, lastly, the post-mortem appearances. The original manuscript had all these heads arranged in columns, forming a tabular view of the whole, but it was found inadmissible in the octavo publication of the Reports.

Case 1.—John W—, æt. 37. Very irritable, and of spare habit. Fell on iron railings, the spike entering the inner side of the right thigh, piercing the fascia. Admitted on the following day. Tetanus set in twenty-eight days after the injury, on July 5th, 1825. Cloudy and hazy; north winds, W., N.E., N.; temp. 65° to 70°. *State of the wound* at the time, healed. The *symptoms* were gradual, and at

height on fourth day; deglutition difficult. Relief up to thirteenth day, when paroxysms with exhaustion set in, and rigidity of muscles and anxious respiration. Hydrocyanic acid for two days, without benefit; then opium, stimulants, support, with turpentine enemata; on the thirteenth day of attack, blisters applied to the spine. *Death*, from spasm and exhaustion, on fourteenth day of attack. No post-mortem.

Case 2.—Samuel N—, æt. 17. Very irritable, pale, unhealthy. Admitted with jagged wounds on both heels; on the left three inches long: also contusions, and a fracture of the humerus almost compound. Tetanus set in seven days afterwards, on October 17th, 1825. Cloudy and rain; wind W., S.W., W. *Wound* at the time suppurating and healthy. The *symptoms* were sudden, and very violent, attended with universal rigidity. Stimulants; musk, opium, support; turpentine enemata. *Death* from spasm, forty hours. *Post-mortem*, twelve hours: Brain and cord healthy; no traces of inflammation; the nerves at the wound healthy; sympathetic system healthy; heart, right side full of firm coagulum; lungs congested; intestines much contracted.

Case 3.—R. B—, æt. 30. A muscular, fine man. Crushed the little finger between two barrels. Tetanus set in on the eighth day, when he was admitted, on November 25th, 1826. Clear; brisk wind, S.W., S.W.; temp. 34° to 38°. *Wound* at the time healing. *Symptoms:* Spasms increased by the slightest noise; had painful deglutition; livid countenance; jaws relaxed during sleep. Calomel and opium; purgatives; opium enemata. *Death* on third day, from spasm. No post-mortem.

Case 4.—Henry S—, æt. 14. Had a bite on the leg from a dog, followed by ulceration. Tetanus set in ten days after, on September 23d, 1827. Cloudy; showery; strong winds, S.S.W., S.S.W., S.S.W.; temp. 55° to 57°. Admitted on the eleventh day of the attack; the sore was indolent, of the size of half-a-crown, with flabby granulations and elevated jagged edges. The *symptoms* were gradual, not severe; he could with effort open the mouth; had occasional exacerbations, with frequent biting of the tongue; opisthotonos; it was considered to be a well-marked and decided case. Calomel, antimony, and opium; twenty leeches to spine at nine successive periods, without benefit; changed to sulphate of zinc, two grs. every six hours, and increased up to eight grs., then diminished; purgatives and support at the same time; Ung. Canth. was applied to the wound, and followed by black wash. *Recovery* at the end of a month.

Case 5.—William T—, æt. 70. Intemperate. Received an extensive lacerated wound of the right arm, for which he was admitted. Tetanus set in on the tenth day after, on October 5th, 1827. Fine and cloudy; winds, N.N.E., S.S.W., N.N.E.; temp. 54° to 62°. *Wound* at the time sloughing. The *symptoms* were those of chronic tetanus; he never had violent opisthotonos, but general spasms, and rigidity of abdominal muscles; there was a good deal of delirium during his last days, attended with relaxation of the jaws. Fluid opium in large doses, with ether and ammonia; relief to spasms. *Death* on thirty-second day, from exhaustion. *Post-mortem*, forty-eight hours: Decomposition; medulla softened; heart nothing remarkable; lungs slightly indurated, and contained inactive tubercles; intestines nothing remarkable; spleen small and soft.

Case 6.—Female, æt. 15. Admitted for deformity from cicatrices after burn of twelve years' standing; one week afterwards, division of the cicatrices performed by

removing the anterior and posterior folds of the axilla. Tetanus set in twenty-one days after, on October 5th, 1827. Fine and cloudy; wind N.N.E., S.S.W., N.N.E.; temp. 54° to 62°. *Wound* at the time healing. *Symptoms:* Spasms induced by the slightest excitement; difficult deglutition. Calomel and opium; turpentine enemata; warm bath. *Death* on eighth day. No post-mortem.

Case 7.—Edward W—, æt. 50. Admitted for compound fracture of the right leg, and simple fracture of the head of the left tibia. Tetanus set in on seventh day, on December 10th, 1828. Fine and clear; wind W.S.W., S.W., W.S.W.; temp. 44° to 46°. *Wound* sloughy and inflamed. *Symptoms* very severe. Opium. *Death*, twenty-four hours, during a paroxysm. *Post-mortem:* Nothing remarkable in the head, chest, or abdomen; nerves at the seat of both injuries unaffected.

Case 8.—William N—, æt. 24. Fine, stout; been living low. A rusty nail had entered the outside of left foot; four days after he bathed in the river while heated. Tetanus set in five days after injury, and one day after bathing, on June 16th, 1829. Rain, cloudy; wind N.W., W.S.W., S.W.; temp. 60° to 76°. Admitted on the fourth day of attack, the *wound* being small, dry, and not inflamed. The *symptoms* were acute, with great thirst, but easy deglutition. Relaxation of the muscles before death. Venesection before admission. Opium; antimony; purgatives; blisters to the spine, with relief. *Death* on fifth day; sudden, whilst being raised in bed. *Post-mortem*, six hours: Brain and cord only examined; nothing morbid, either in colour or consistence. Wound very small, and not completely closed.

Case 9.—Ann B—, æt. 30. Plethoric, and addicted to drinking. Met with an incised wound over the extensor tendon of the left thumb, but had, previous to this, received an injury to the head from a fall on an iron spike. Tetanus set in three days after the wound of the hand, on May 4th, 1830. Clear, cloudless; light, brisk wind, E., N., W.; temp. 57° to 62°. Admitted on fifteenth day of attack. *Wound* healed and cicatrized. *Symptoms* severe; had remission of spasms for two days, but recurred again with intensity; had also spasms of the hand. Calomel and antimony at first; then sulphate of zinc, one gr. every hour, increased gradually up to three grs.; leeches and blisters to the spine; blisters to the cicatrix twice, producing slight discharge. *Death* in twenty-one days, during a paroxysm. *Post-mortem*, five hours: Body rigid; brain ulcerated on under surface of anterior lobes, the result of injury to the head; nerve at the seat of wound had been divided, but united, and no inflammation. Heart, right side slightly loaded. Lungs healthy. Intestines healthy, and distended with gas. Spleen pale and soft.

Case 10.—John F. A—, æt. 45. Received a lacerated wound above the left ear, from a blow by a brick. Tetanus set in four weeks after, on November 29th, 1830. Overcast, light rains; wind E.S.E., S.E., S.E.; temp. 42° to 43°. Admitted a few days after the symptoms, the *wound* being unhealthy, with a sanious discharge. Had trismus, and occasional spasms; tetanic *symptoms* not acute, and at times alleviated, but never thoroughly ceased; complicated with difficulty of articulation, and some signs of compression. Three weeks after admission had erysipelas of head and face. A piece of loose bone removed. Purgatives; croton oil, enemata of tobacco and turpentine, with relief. *Death* in twenty-eight days, from combination of tetanus and erysipelas. *Post-mortem:* Brain and cord healthy and firm; encysted abscess in hemisphere of brain, near the wound; viscera of chest and abdomen healthy; wound healed, but suppuration about the cicatrix.

Case 11.—James C—, æt. 30. Robust, phlegmatic; an Irishman. Had the extremity of the ring finger and half of the middle one torn off; six days after, nail removed; the wound sloughed, and there was absorbent inflammation. Nitric acid lotion and a poultice were applied. Eleven days after accident, fell fourteen feet, and lacerated his scalp. Tetanus set in fourteen days after the first injury, and three days after the second injury, on September 28th, 1831. Fine; wind E., E., E.; temp. 61° to 67°. Admitted on fourth day of attack. *Wound* of finger nearly healed, and granulating. *Symptoms* not severe, but soon became so; difficulty of swallowing; relaxation of muscles before death. Calomel and opium; tobacco enemata, to great extent producing prostration, without relief; blisters to spine, and dressed with opium; belladonna liniment to abdomen. *Death* in nineteen days, from exhaustion. No post-mortem.

Case 12.—William C—, æt. 40. A clean nail entered the ball of left thumb; twenty-six days after became exposed to cold for two nights. Tetanus set in four days after exposure, and thirty days after injury, on December 14th, 1831. Rain and wind, S.W., S.S.W., S.E. var.; temp. 42° to 45°. Admitted on twelfth day of attack. *Wound* healed. *Symptoms* mild in accession, but severe when they set in. Opium and purgatives. *Death* in twenty-two days, during a paroxysm. No post-mortem.

Case 13.—William A—, æt. 24. Muscular, well formed. Admitted with compound fracture of the tibia and fibula, and muscles torn; the ends were placed *in situ*, and sutures passed through the skin; the wound sloughed, and the tibia protruded and part thereof sawn off, in the second week. Tetanus set in twenty-seven days after admission, but two days before the attack he was exposed to a draught of air through a window over his bed; the attack occurred on August 15th, 1834. Fair; wind N.E., N.E., S.W.; temp. 63° to 73°. *Wound* at the time healthy and cicatrizing. *Symptoms* gradual, severe on the third day, and continued so until the ninth day; on the eleventh day a miliary eruption appeared over the body, attended with succession of spasms and intervals of repose; on the sixteenth day exhaustion and rambling; on the twenty-second day subsidence of symptoms. Opium; castor oil; then musk, increased up to twenty-five grs. every four hours, and afterwards reduced to ten grs.; wine; support; tonics. *Recovery* in twenty-two days; protracted.

Case 14.—William T—, æt. 38. Fellmonger. Exposed to great heat, and whilst in a state of perspiration threw off his jacket. He had one or two excoriations on the fingers, from friction of a brush used in his employment. Admitted on fifth day of attack, on August 13th, 1835. Excessively hot; wind N.E., W., S.; temp. on the 11th, 82°; 12th, 69° to 78°; 13th, 70°. Excoriations healed. Usual symptoms of confirmed tetanus. Calomel, opium, and antimony; afterwards quinine in large doses, taking two oz. in twenty days; support, and wine. He had two shower-baths on the eighth day, but with bad effect. *Recovery* on twenty-ninth day.

Case 15.—Dennis C—, æt. 21. Muscular, healthy. Jambed the left middle and ring fingers between two stones, but previous to that had been exposed to wet and damp. Tetanus set in on twelfth day after, on March 26th, 1836. Cloudy; light rain; windy, S.W. var., S. var., S. var.; temp. 42° to 49°. Admitted on tenth day of attack. *Wound* cicatrized. *Symptoms* were gradual and slow; no severe opisthotonos. On the fourteenth day there was aggravation of the spasms, with

dysphagia. Colchicum as a purgative; low diet; but on fourteenth day of attack, or four days after admission, quinine and wine were substituted. *Recovery* at the end of a month.

Case 16.—Louisa C—, æt. 13. Admitted with severe burn. Tetanus set in thirteen days after, on October 23d, 1836. Light rain, and slight wind, E., E., E.S.E.; temp. 57° to 62°. An acute case. *Death* in six days.

Case 17.—James H—, æt. 30. Well developed, remarkably fat. Received a lacerated wound over the malar bone, with comminuted fracture thereof, from the kick of a horse; he lay in a hayloft all night. Tetanus set in five days after, on September 7th, 1837. Fine; brisk wind, S., N., S.; temp. 59° to 63°. Admitted on fifth day of attack, the wound then suppurating. *Symptoms* severe, with inability to swallow. *Death* in a few hours after admission. *Post-mortem:* Portio dura inflamed; brain healthy; heart large; lungs, old adhesion and congested; intestines natural; spleen small, soft, and congested.

Case 18.—F. C. L—, male, æt. 14. Subject to epilepsy. Admitted with severe laceration of leg. Tetanus set in nineteen days after, on June 25th, 1838. Fine; light winds, N.N.W., E., N.W.; temp. 68° to 71°. *Wound* at the time healthy and suppurating. *Symptoms* severe, with convulsions. Calomel and opium; turpentine enemata. *Death* in forty hours.

Case 19.—Henry S—, æt. 30. Healthy, employed in a cider-manufactory. Received a slight laceration on dorsum of left hand, from crush. Tetanus set in six days after, on July 31st, 1838. Fine, but rained the two previous days; wind S., S.W. var., S. Admitted on fifth day of attack. *Wound* granulating. *Symptoms* severe, slightest touch induced paroxysms; partial relaxation of jaw after purging; exhaustion. Ung. Veratriæ to spine; colchicum until active purging; then quinine and sherry; cider *ad libitum*. *Death* on seventh day, sudden, from spasm during administration of an enema. *Post-mortem:* Brain healthy; right lung emphysematous; wound nearly cicatrized; some filaments of radial nerve entered the cicatrix, and were pinkish.

Case 20.—George O—, æt. 40. Strong, healthy, and temperate. Received a bite on right hand from dog. Punctured wound, small, and healed quickly. Tetanus set in twelve days after, on August 19th, 1838. Overcast; W., W.S.W., N.N.E. Admitted on third day of attack. *Wound* healed, but become red. Countenance cheerful; severe opisthotonos; difficult deglutition. The wound was laid open. Quinine and opium; turpentine enemata. On second day in hospital and fourth day of attack a tooth extracted, to administer food, when violent spasms came on, and immediate *death* took place.

Case 21.—Joseph R—, æt. 40. Healthy, fair, and of quiet disposition. Had a slight fall on back of head whilst sliding. No wound. A month before this, cut his finger, which cicatrized. Tetanus set in four days after fall, on January 17th, 1839. Fine; wind throughout the day and previous days, W.N.W., W., W.; temp. 30° to 37°. Admitted on fifth day of attack. *Wound* on finger cicatrized. Head bruised. *Symptoms* severe. Muscles of face specially affected, with closure of eyelids; respiration difficult. Three days after admission passed two large round worms. Cessation of spasm previous to death. Bled and blistered before admission. Belladonna to finger; calomel and opium; purgatives; on third day of admission tonics and stimulants. *Death* on twelfth day, from exhaustion. *Post-mortem*, seven hours:

Brain and cord healthy; congestion of lungs, old adhesion, vessels congested; intestines congested, and a portion of ileum had intussusception; spleen healthy.

Case 22.—Thomas N—, æt. 53. Admitted with compound fracture of fore and ring fingers; the latter became gangrenous, and was amputated nine days after; severe hæmorrhage ensued; metallic sutures were used five days after the operation. Tetanus set in fifteen days after original injury, on January 31st, 1839. Fine; W., S.W., W.; temp. 27° to 33°. Stump at the time sloughy; spasms chiefly confined to jaw, neck, and throat, and induced by slightest noise; relaxation of spasm the day before death. Turpentine to wound; tobacco and turpentine enemata; stimulants and wine. *Death* on seventh day, from exhaustion.

Case 23.—Richard S—, æt. 46. Healthy. Admitted with compound dislocation of ankle and fracture of astragalus, the upper part of which was removed. Tetanus set in seven days after, on August 11th, 1839. Cloudy; wind S.W. var., S.W., S.S.W.; temp. 63° to 69°. *Wound* suppurating, profuse, and fetid, and continued up to death. *Symptoms* severe; had delirium before symptoms set in, which subsided entirely when tetanus became confirmed. Quinine and wine; subsequently, hydrocyanic acid. *Death* on fourth day.

Case 24.—Richard D—, æt. 62. Drunkard, and impaired health. Received slight graze of arm above elbow. Tetanus set in seven days after, on May 24th, 1840. Fine; light wind, S.W. var., W., N.W.; temp. 61° to 64°. Admitted on seventh day of attack. *Wound* cicatrizing. *Symptoms* confirmed. Skin of abdomen peculiarly shrivelled. On evening of ninth day of attack found sleeping with mouth wide open. Opium to wound; stimulants and purgatives. *Death* on twelfth day, from exhaustion.

Case 25.—Richard B—, æt. 51. Received a lacerated wound of hand. Tetanus set in six days after, on July 31st, 1840. Fine; slight rain, light winds, N.W., S.W., N.W. Admitted on fifth day of attack. *Wound* suppurating, and continued so up to death. Confirmed and severe opisthotonos. Colchicum internally; Ung. Veratriæ to spine. *Death* on seventh day. *Post-mortem:* Too decomposed.

Case 26.—James G—, æt. 40. Large framed, muscular, and fat. Met with a compound fracture of the left ring finger. Tetanus set in three days after, on January 15th, 1841. Slight rain and wind, N.W., N.E., S.; temp. 35° to 47°. Admitted on second day of attack. *Symptoms* acute. Purgatives; stimulants; antispasmodics. *Death* on seventh day, from spasm. *Post-mortem:* Brain and cord not examined; heart, right side gorged with blood; larynx, no signs of inflammation; lungs œdematous, old adhesion; intestines healthy.

Case 27.—Henry H—, æt. 13. Emaciated. Received a punctured wound of the left middle toe, whilst bathing; he bathed for two or three times afterwards. Tetanus set in on third day from the wound, on June 19th, 1842. Heavy rains and wind, S., E., S.; temp. 60° to 68°. Admitted on fourth day of attack. Nothing remarkable observed about the wound. *Symptoms* severe. Turpentine enemata; mercury. *Death* shortly after admission, from suffocation during a paroxysm. *Post-mortem:* Cord of natural firmness, but injected; lungs in part consolidated; epiglottidean folds loose, and caught in the rima, thus closing the larynx.

Case 28.—James S—, æt. 22. Healthy, muscular; a teetotaller. Nine months ago fractured his leg, and had speedy union. Met with an abrasion of the finger, which was followed by gangrene, and also gangrene of the toes, owing to exposure. Tetanus set in on sixth day after, on February 8th, 1843. Sharp frost, and previously

much snow, wind and rain, E., N., N.W.; temp. 34° to 38°. Admitted on ninth day of attack. *Wounds* in state of gangrene, and sloughing of the tendon of the finger. *Symptoms* severe; dysphagia; violent convulsions, and rigidity of muscles; during the paroxysm mouth foaming, and countenance livid. Opium, ammonia, and bark; cannabis indica administered four days after admission, but given only four times, as act of swallowing excited fearful spasms; enemata; cotton wool to feet. *Death* on fourteenth day, from spasm and syncope. *Post-mortem*, thirty-three hours: Brain and cord darker than natural; heart, right side flaccid, left firmly contracted; larynx free; lungs congested and fluid in pleural cavity; intestines healthy; spleen healthy.

Case 29.—William W—, æt. 40. Well made, muscular. For five years subject to scrofulous ulcers on the leg; these never discharged much, nor had the discharge ceased suddenly; he often had cramps. Exposure to gust of cold air whilst heated, followed soon after by tetanus, April 29th, 1843. Rain and wind, W., E., N.W.; temp. 49° to 55°. Admitted on fourth day of attack. Ulcer on leg of size of a shilling, discharging. An idiopathic case. *Symptoms* slight at first, but afterwards severe; difficult deglutition. Cannabis indica; took 248 grs. in six days; at first administered by mouth, afterwards by enemata. *Death* on tenth day. *Post-mortem:* Body rigid; brain and cord natural, plates of bone on spinal arachnoid; cerebro-spinal fluid in large quantity; heart on both sides contained blood, dark-coloured, like currant jelly; lungs emphysematous; colon greatly distended.

Case 30.—William N—, æt. 35. Had a crushed right fore-finger. Tetanus set in six days after, on April 9th, 1844. Very fine, and hot, W., S.W., N.E.; temp. 29° to 73°. Admitted on third day of attack. *Wound* granulating. *Symptoms* acute, and *died* the day after admission. Calomel and opium; purgatives and enemata. Twenty-four hours before the attack came on he had darting pains from wound to axilla.

Case 31.—Edward P—, æt. 18. Lean; bad home and bad living. Received a slight prick of the finger, but got wet the day before. Tetanus set in the day after injury, on June 27th, 1844. Fine, N., N., S.W.; temp. 50° to 58°. Admitted on second day. *Wound* not visible. *Symptoms* severe; convulsive paroxysms. Calomel, antimony, and opium; purgatives; turpentine enemata. *Death* on third day. *Post-mortem:* Brain dark and flabby; cord firm; pulmonary apoplexy; intestines healthy.

Case 32.—Thomas M'M—, æt. 42. Tall, muscular, in good health. Served in army eighteen years, and discharged two years ago, for chronic cough and palpitation of heart. Admitted with a compound comminuted fracture of tibia and fibula, from falling thirty feet into a well containing fifteen inches of water; it was placed on a splint, and Tr. of benzoin applied to the wound. Tetanus set in six days after, on October 5th, 1844. Very fine, S.W., S.W., S.W.; temp. 41° to 70°. *Wound* healthy, free suppuration. *Symptoms* acute, slightest attempt to swallow inducing paroxysm. The wound was enlarged, and extract of conium applied. Turpentine enemata; Tr. Opii internally, but afterwards replaced by opium suppositories and enemata; beef tea and stimulants, also per rectum; belladonna liniment to the scrob. cordis. *Death* in nineteen hours, during convulsions. Fractured end of bone found pressing against the post. tibial nerve, which latter was inflamed and softened.

Case 33.—William W—, æt. 37. Lean. Crushed the left fore-finger between two pieces of iron. Tetanus set in six days after, on January 31st, 1845. Frosty; boisterous rain on the 27th; N., S.W., W.; temp. 22° to 35°. Admitted on second day of attack. *Wound* sloughing and angry. Severe spasms every quarter of an hour; difficult deglutition, and fear of fluids; spasms subsided before death. Amputation of finger. Aconitine to spine, and region of the diaphragm; fluid opium in large quantities. *Death* on third day, from exhaustion. *Post-mortem:* Nerves at the seat of wound on both sides of the finger, to the extent of one inch, inflamed; brain and cord congested; lungs fleshy, not distended; blood black, thick, and grumous.

Case 34.—Rosa B—, æt. 8. Cheerful; in good health. Received a compound fracture of the humerus. Tetanus set in two days after, on June 28th, 1845. Heavy showers; W., S.W., W.; temp. 43° to 69°. Admitted on fifth day. *Wound* healthy, and bones in apposition by means of splints. *Symptoms* very severe; spasms without intermission. *Death* ten minutes after admission. Nerves at seat of wound inflamed; the median and ulnar.

Case 35.—James L—, æt. 12. Had a slight laceration of foot from a rusty nail. Tetanus set in on fifth day, on June 29th, 1846. Fine; warmer than usual, S.W., S.W., S.W.; temp. 57° to 76°. Admitted on second day of attack. *Wound* inflamed. *Symptoms* severe; spasms of laryngeal muscles. *Death* on same day, from asphyxia. Warm bath; jugular vein opened, and twenty ounces of blood taken.

Case 36.—Mary A. W—, æt. 9. Spare and healthy. Admitted with severe burn over right leg, thigh, and side; this was dressed with oil and lime-water. Tetanus set in ten days after, on November 16th, 1846. Overcast; cloudy, E., E., N.E. Temp. 39° to 48°. *Wound* sloughing and very irritable. *Symptoms* severe and acute. Opium and stimulants. *Death* in fifty hours, during a spasm or fit. *Post-mortem*, thirty-one hours: Body rigid; brain and cord congested, but normal; heart, cavities not distended with blood; lungs congested; few ascarides in rectum; intestines healthy; spleen firm.

Case 37.—James P—, æt. 67. Admitted with compound fracture of tibia and fibula, extending to ankle. Tetanus set in nine days after, on November 27th, 1846. Dense fog, S.W., S.W., S.; temp. 32° to 44°. *Wound* sloughing and suppurating. *Symptoms* gradual, but became severe on third day, and continued so. Had constipation for eight days previous to the attack. Enemata; purgatives; opium; and stimulants. *Death* on fourth day, from spasm, whilst drinking.

Case 38.—Mary B—, æt. 25. Admitted for extensive burn of arm, shoulder, and wrist, exposing the cutis, caused by fall into the fire during an epileptic fit. Oil and lime-water applied. Tetanus set in on twenty-first day, a few days before the expected epileptic seizure, November 30th, 1846. Sharp frost, N., N., N.; temp. 27° to 34°. *Wound* suppurating, and in part cicatrizing. *Symptoms* gradual, severe on third day; difficulty of swallowing, complicated with screaming and convulsions, partaking of those of periodic epileptic seizures. Opium; assafœtida enemata. *Death* on fourth day, during a convulsive paroxysm. *Post-mortem*, twenty-three hours: No marked rigidity; brain and cord offered nothing remarkable to be detected.

Case 39.—Alfred B—, æt. 14. Strong, healthy, fair. Admitted with a lacerated

wound, three inches long, on the dorsum of the hand, and about twenty small punctures on palm, from cog-wheel. Tetanus set in on tenth day, June 12th, 1847. Great heat, S.W., W., N.W.; temp. ranged from 53° to 74°. *Wound* granulating and discharging a good deal of dirty, yellowish pus. *Symptoms* severe; intense spasms at times. Extr. Bellad., $\frac{1}{6}$ gr. 4tis horis. Blister to spine; turpentine enemata; support. Vapour of ether administered per rectum several times with relief. *Death* from asphyxia on seventh day. *Post-mortem*, twenty-one hours after: Extremities rigid; brain and cord pinkish; radial nerve at injury divided and ends bulbous; heart, soft clots in both cavities; lungs healthy; spleen healthy; colon contained fæces.

Case 40.—William G—, æt. 33. Strong, robust; a drinker. Is subject to chafing of the skin of the hand; has had a strumous abscess over sternum, forming an open sore, for two years, and received a blow on sternum two weeks before the attack. Whilst lifting and carrying coals, he strained his back, afterwards got wet through, and sat for two hours before a hot fire; on next day had stiff neck, but went to work, and again was wet through. Tetanus set in five days after strain, on November 5th, 1847. Fine, rain previously, S., E., S.; temp. 44° to 56°. Admitted on fifth day of attack. No wound observed; cicatrix on hand visible. *Symptoms* gradual; had opisthotonos on admission whilst being warded; became severe, with difficulty of swallowing, and great prostration. Calomel and opium; support and wine; vapour baths, with relief. *Death* from spasm of glottis on seventh day. No post-mortem.

Case 41.—John D—, æt. 41. Muscular, well developed. Received a wound over right eyebrow. Tetanus set in on sixth day after, on January 1st, 1848. Sleet and showers, S.E., N.E., S.; temp. 29° to 42°. Admitted on second day of attack. *Wound* scabbed over. *Symptoms* acute, threatening suffocation; laryngotomy performed. *Death* on the day of admission, from suffocation. Venesection before admission. *Post-mortem*, seventy hours and a half after: Brain congested; cord of higher tint; heart violently contracted; lungs apoplectic and emphysematous; intestines healthy.

Case 42.—Richard W., æt. 38. Received a deep lacerated wound of the sole of the right foot, of the size of the palm of the hand. Tetanus set in six days after, on June 16th, 1848. Fine; heavy showers on the 13th; S., E., S.; temp. 54° to 82°. Admitted on second day of attack. *Wound* sloughing. Had no difficulty in swallowing. Division of anterior and posterior tibial nerves under imperfect action of chloroform; opium to the wound; calomel and opium; quinine. *Death* on fourth day, from spasm. *Post-mortem*, fourteen hours: Cord natural in texture, but pinkish; no inflammatory product; ends of divided nerves united by coagulum.

Case 43.—John J—, æt. 30. Received a punctured wound of the right foot, between first and second toes, by dung-fork. Tetanus set in nine days after, on February 25th, 1849. Boisterous; rain; thunder; N.W., N.W., W.; temp. 34° to 51°. Admitted on same day of attack. Skin around puncture was inflamed. *Symptoms* severe; was preceded by pain in the wound and severe pain in the back. Wound enlarged, and aconitine and belladonna applied; calomel, opium, and nourishment. *Death* on third day, sudden, during a spasm. *Post-mortem*, thirteen hours: Cord injected and pinkish; other organs normal.

Case 44.—William M—, æt. 11. Admitted with a lacerated wound of the left

leg, exposing the tibia, the posterior tibial nerve, and laceration of posterior tibial artery, the divided ends of which were ligatured. Tetanus set in twelve days after, on April 25th, 1849. Fine; drizzly; W., N., S.W.; temp. 44° to 62°. *Wound* sloughing and painful. *Symptoms* gradual and mild; had trismus and rigidity of the muscles of the face; the respiratory muscles were affected. Opium; amputation of the leg on third day of attack, with relief and recovery from the symptoms. Phlebitis ensued after recovery from trismus, and *death* in fifteen days.

Case 45.—James B—, æt. 30. Crushed the end of the right thumb. Tetanus set in on fifth day, August 19th, 1849. Fine, N., W., W.; temp. 50° to 72°. Admitted on third day of attack. *Wound* flabby, granulating, pale red. General and violent spasms. Opium; purgatives; support; stimulants. Took three drachms and a half of solid opium. *Death* in twenty-two days. *Post-mortem*, twenty-one hours: Cord firm and rigid; of pinkish hue.

Case 46.—Sarah R—, æt. 41. Well developed; a confirmed drunkard. Received a lacerated wound over the nose, from fall; a sore subsequently formed; and, two months after accident, tetanus set in, on November 5th, 1849. Fine, S.W., E., E.; temp. 42° to 53°. Admitted on second day of attack. Sore excavated; unhealthy, with inflamed edges, and suppurating. Had trismus, and great difficulty in swallowing and respiration. Simulated hydrophobia, for which it was mistaken by some. Apparent recovery, but sudden collapse, and death. Nitric acid lotion to wound; blisters to spine; calomel and opium; stimulants; support; nutritive enemata. Chloroform induced spasms. *Death* in seven days, from exhaustion. *Post-mortem*, fifty hours: Brain and cord exceedingly congested, as well as all the viscera; lungs healthy.

Case 47.—George B. G—, æt. 30. Admitted with compound dislocation of the wrist and comminuted fracture of the radius, from fall. Tetanus set in five days after, on May 14th, 1850. Fine, S.W., N.E., N.W.; temp. 41° to 59°; trismus and slight tetanus. Calomel and opium; purgatives; enemata. *Death* on eighth day. *Post-mortem*, sixteen hours: Dorsal branch of ulnar nerve entirely lacerated; ends swollen and injected; pus burrowed among the deep muscles, half way up the arm; lungs healthy.

Case 48.—Robert O—, æt. 24. Temperate. Crushed the left ring-finger, which was amputated at the London Hospital; inflammation followed, for which he was admitted into Guy's on the sixth day after the operation. Three days after admission he was exposed to cold, and on the following day tetanus set in, being ten days after the injury: on August 4th, 1850. Fine, S.W., E., S.W.; temp. 59°. *Wound* unhealthy, inflamed, and swollen. *Symptoms* commenced gradually, but reached severity on fourth day. Opisthotonos severe for three days, with spasm of the abdominal and respiratory muscles. Symptoms gradually subsided. Quinine, five grs. in solution, every three hours; free use of stimulants; opiates; *recovery* in four weeks.

Case 49.—William K—, æt. 17. Met with laceration of the finger. Tetanus set in on August 22d, 1850. Fine and clear; heavy rains on the 21st, with frost at night; S.W., S., S.W.; temp. 39° to 66°. Admitted on fourth day of attack. *Symptoms* very acute, and *death* on the same day of admission, during a spasm.

Case 50.—Mary A. B—, æt. 28. Subject to rheumatism and great nervous excitability. Admitted with an inflamed bursa patellæ, which was laid open by a longitudinal incision eight days after. Pus escaped; but the wound required enlarging

on the following day. Tetanus set in sixteen days after the first incision, on October 18th, 1850. Very fine; W., S.W., W.; temp. 44° to 63°. *Wound* swollen, with sanious, unhealthy discharge. *Symptoms* severe; deglutition easy up to fifth day, when severe spasm of diaphragm ensued, with paroxysms of shrieking and convulsions, and inability to micturate; calomel and opium; aconitine to the neck, spine, and scrob. cordis, with relief; belladonna to the sphincter ani to relax the muscle, and with effect. *Death* on the seventh day, from suffocation and spasm. No examination permitted.

Case 51.—Young man, æt. 18. Admitted with a crushed right fore-arm from machinery; gangrene followed; spontaneous separation, assisted on thirteenth day by division of the ligaments of the elbow-joint and median nerve. Tetanus set in six days after the operation, and nineteen days after the injury, on June 20th, 1851. Very fine; S.W., S.W., W.; temp. 59°. Had trismus, rigidity of the abdominal muscles, with risus sardonicus. No severe spasms. Gradual subsidence on the eighth day. Had troublesome constipation. Quinine, three grs., every three hours; aperients. *Recovery*.

Case 52.—Thomas C—, æt. 23. Admitted with a lacerated wound on inner side of ankle, with contusion of the loins. Tetanus set in fourteen days after, on June 22d, 1851. Very fine; N.W., N.E., S.W.; temp. 41° to 67°. *Wound* discharging freely. *Symptoms* preceded by great pain in the wound; morphia to the wound; quinine; wine; purgatives; morphia. *Death* on seventh day. No examination.

Case 53.—William A—, æt. 35. Admitted with lacerated wound on outer side of left knee, two inches long. Tetanus set in eleven days after, on July 22d, 1851. Fine; heavy rains on the 19th; E., W., S.W.; temp. 61°. *Wound* improving. Had opisthotonos but easy deglutition. Relief up to fourteenth day, when became suddenly worse, and *died* from exhaustion on sixteenth day. At first calomel and purgatives; on third day quinine; support, and wine, twenty oz., daily; bread poultice to the wound.

Case 54.—James M'C—, æt. 50. Admitted with compound fracture of the finger, attended with gangrene. Tetanus set in twelve days after, on April 10th, 1852. Fine; E., S E., E.; temp. 41° to 54°. *Wound* gangrenous. *Symptoms* acute and severe. Purgatives; morphia; quinine, five grs.. every four hours; poultices to the wound. *Death* on third day. No post-mortem.

Case 55.—Emma H—, æt. 11. Emaciated. Admitted for a burn. Tetanus set in nine days after, on November 24th, 1852. Fine and rain; N., S.W., E.; temp. 47° to 56°. *Wound* granulating. *Death* in four days. *Post-mortem:* Heart healthy; lungs pneumonic; no ulceration of the bowels.

Case 56.—George R—, æt. 23. Of middle stature; fair. Had scarlatina two years ago and hoarseness last winter. No history of injury or exposure. Tetanus set in after severe purging, on May 4th, 1853. Constant rain; E., E., E.; temp. 39° to 55°. Admitted on fifth week of attack. The *symptoms* were gradual, and at first thought to be rheumatism. On admission not severe, but well marked; with rigidity of muscles of back, abdomen, jaw, and neck; deglutition easy; slow recovery; the abdomen remained rigid for two weeks, and the respiration was abdominal. He had imperfect power over arms and legs. Took mercury before admission; ordered quinine, three grs. ter die; wine. *Recovery* three weeks after admission and eight weeks after onset.

Case 57.—Thomas C—, æt. 9. Received a lacerated wound of left ring-finger; it did not heal, and phalanx became exposed, which was removed by forceps a month after, and was followed on same day by tetanus, on May 16th, 1853. Very fine; rain on the 13th; E., S.E., E.; temp. 47° to 69°. Admitted on fourth day of attack. *Wound* sloughing. *Symptoms* severe. On eighth day had delirium, and threatening suffocation, with loss of power over left hand. Aconitine to hand; quinine for one day; replaced by Hydr. cum Cret. and Dover's powder, with assafœtida enemata. *Died* on tenth day, from spasmodic closure of glottis. No post-mortem.

Case 58.—George W—, æt. 11. Healthy, tall, well nourished. Had a crushed middle toe and bruised foot, requiring amputation of the former. Tetanus set in fourteen days after, on March 9th, 1854. Overcast; frosty; S.W., S.W., S.W.; temp. 48° to 63°. Admitted on fourth day of attack. *Symptoms* severe and acute. Chloroform inhalation for sixteen hours, with temporary benefit; tinctura cannabis indica in half-drachm doses every four hours. *Death* in six days. *Post-mortem*, seven hours: Brain and cord healthy; no inflammatory cells; nerves at seat of injury healthy; heart distended on right side; lungs congested and apoplectic; intestines much contracted; spleen small, pale, and firm.

Case 59.—George B—, æt. 32. Healthy; sober. Admitted with compound fracture of the thumb, with severe laceration. Tetanus set in eleven days after, on June 25th, 1854. Fine; S., S.W., S.W.; temp. 81°. Discharge from wound ceased. Previous to attack, pain shot up arm from wound; deglutition difficult and inducing paroxysms. Ung. Sabinæ to wound, causing great pain; replaced by morphia; chloroform inhalation, without relief; opium and quinine; beef-tea enemata. *Death* from exhaustion on sixth day. No post-mortem.

Case 60.—Emily M—, æt. 38. Received an abrasion of the hand from scratch, followed by abscess of thumb. Tetanus set in on July 24th, 1854. Sultry; very hot; wind, S.E., S., S.W.; temp. 85°. Admitted on second day of attack. *Symptoms* acute, complicated with chronic bronchitis. Quinine, four grs., in solution every four hours; turpentine enemata. *Death* in forty hours, whilst at stool and from sudden suffocation.

Case 61.—William B—, æt. 33. Admitted with lacerated wound of foot by piece of iron. Tetanus set in on eighth day, on September 11th, 1854. Very fine; wind, S.E., N.E., N.E.; temp. 73°; cholera season. *Symptoms* acute, had difficulty in swallowing. Quinine and brandy. *Death* in two days.

Case 62.—John C—, æt. 67. Received an abrasion of knuckle of right ring-finger from kick of horse. Tetanus set in on sixth day, on December 2d, 1854. Clear; fine; wind, N.W., W.; temp. 46° to 51°. Admitted on the second day of attack. Had difficult deglutition; no general spasm but coma, probably owing to large quantity of morphia given. Quinine and morphia in large doses. *Death* on fourth day, comatose.

Case 63.—Elizabeth H—, æt. 9. Emaciated. Admitted with burn over upper part of body and both arms. Tetanus set in on ninth day, on April 14th, 1855. Fine and foggy; wind, W., S., S.W.; temp. 57° to 62°. *Wound* granulating favorably; healthy. *Symptoms* rapid; limbs rigid; no convulsions; took food during the day, but had difficulty in swallowing. *Death* in four or five hours. *Post-mortem*, forty-seven hours: Brain and cord healthy but firm; heart firm, clot on both sides; lungs healthy; duodenum healthy; in the ileum the Peyer's patches

well marked from congestion, and the mucous follicles enlarged throughout intestines; spleen healthy, and its corpuscles large.

Case 64.—Benjamin S—, æt. 8. Strong, healthy. Admitted with compound fractured metacarpal bones of left hand, and laceration of dorsum, also a slight graze of neck. Tetanus set in on tenth day, on April 14th, 1855. Fine and foggy; wind, W., S., S.W.; temp. 57° to 62°. *Wound* sloughing and painful. *Symptoms* acute; difficulty in swallowing; quinine and dilute hydrocyanic acid. Aconitine to spine. *Death* in seven days, from exhaustion.

Case 65.—Abraham W—, æt. 13. Healthy. Received a contused wound of foot from cart-wheel passing over it; three days after had slight spasm of the leg. Tetanus set in on tenth day, on July 13th, 1855. Clear; heavy rain on 11th; S.W., N.W., N.; temp. 59° to 78°. Admitted on second day of attack. *Wound* superficial, the size of a shilling, and had ceased to suppurate. *Symptoms* severe; could swallow; paroxysms every twenty minutes; on fifth day retention of urine, requiring the catheter. Was sleeping for a few hours, when he suddenly woke up and expired in a paroxysm, on sixth day. Quinine; morphia; wine and nourishment. No post-mortem. Immediately after death, all the muscles much more rigid than they had ever been before.

Case 66.—Martha B—, æt. 24. Tolerably well nourished; had suffered from dysphagia and dyspnœa for eight months. Admitted for an ulcer on the left side of the neck, of the size of the palm of the hand, the result of abscess of three weeks' standing. Tetanus set in seven days after admission, on October 2d, 1855. Foggy and cloudy; showery; W., S.W.; temp. 66°. *Wound* granulating and suppurating. Trismus; spasms of muscles of back of neck, and spasms more on the right side; difficult swallowing and breathing; complicated with chronic laryngitis and bronchitis; fed by injections. *Death* on sixth day, sudden, from suffocation. *Post-mortem*, twenty-six hours: Filaments of facial nerve spread over the ulcer; brain and cord not examined; heart, right side full of blood, dark and fluid—the same on left; lungs gorged, and recent bronchitis; epiglottis extensively diseased, thickened; intestines healthy; spleen large and soft.

Case 67.—Richard N—, æt. 35. Temperate; muscular; nervous, and very excitable. Received a laceration of right ring-finger, it was almost detached; amputation recommended, but refused. Tetanus set in twelve days after, on January 25th, 1856. Wind and rain; heavy squalls thereof on the 24th; S.W., S.S.W., S.W.; temp. 39° to 48°. Admitted on third day of attack. *Wound* granulating. *Symptoms* well marked; paroxysms induced by the slightest attempt to swallow, or irritation of surface of the body. Chloroform inhalation for twenty-four hours continuously; injections of beef tea and quinine. *Death* in four days.

Case 68.—Timothy R—, æt. 20. Healthy; strong. Admitted with laceration of the index finger, requiring amputation under chloroform; middle finger also lacerated. Tetanus set in on sixth day, on March 3d, 1856. Cloudy and cold; slight rains on the 2d; N.E., N.E., N.E.; temp. 44°. *Wounds* healing, but discharge became thin and glairy; jaws perfectly closed; difficult deglutition; severe paroxysm before death. Aconitine to wound; purgatives; quinine; opium enemata substituted when he could not swallow. *Death* in twenty-four hours, from suffocation. No examination. Heart's action continued for a short time after he had ceased to breathe.

Case 69.—James T—, æt. 53. Healthy, well nourished; a drinker; an omnibus-conductor. Met with a lacerated wound on the bridge of the nose, from fall during state of intoxication; got wet through and exposed several times afterwards. Tetanus set in on ninth day, on June 24th, 1856. Overcast; cloudy; rain on the 22d, and previously; W., N.E., N.W.; temp. 68°. Admitted on fifth day. *Wound* scabbing and dry. Muscles of jaw, neck, and throat chiefly affected; occasional opisthotonos, and very severe at times; rigidity of abdominal muscles; had difficult deglutition, and threatening suffocation for two days; spasm, induced by slightest draught of air or contact of fluids, for those two days, requiring the administration of his nourishment by enemata. Quinine, four grs., every four hours. *Recovery* in three weeks. Was seen in June, 1857, and then had still some stiffness about the jaws.

Case 70.—Richard P—, æt. 47. Muscular; of regular habits; in good health. An iron spike entered sole of foot between metatarsal bones to near the dorsum. Tetanus set in on tenth day, on August 6th, 1856. Cloudless; calm; E., N.E., E.; temp. 69° to 79°. Admitted on third day. A mere puncture visible, but suppurating and sloughing underneath. *Symptoms* intense; continuous. Quinine and wine. *Death* on fourth day, during spasms. *Post-mortem*, forty-one hours: Body much decomposed, but rigid; brain and cord decomposed; heart, right side more than usually distended with dark fluid blood,—left side had a small quantity of blood; considerable suppuration about the wound.

Case 71.—John B—, æt. 23. Temperate; good health. Four years ago he had smallpox, and made a good recovery. No evidence of injury, but exposure to cold. Tetanus set in on November 17th, 1856. Fine; sharp frost; W., N., N.; temp. 22° to 49°. Admitted on ninth day of attack. Had been treated for rheumatism before admission. *Symptoms* were—trismus; stiffness of back, loins, and knees; legs stiff and rigid; abdominal muscles tense; spasm of the orbicularis palpebrarum, giving the appearance of ptosis. Quinine; turpentine enemata. Slow *recovery*, in twenty-nine days.

Case 72.—John H—, æt. 22. Emaciated, weak, very strumous; led a dissipated life. Had the leg amputated nine years ago, at St. Bartholomew's Hospital, for strumous disease of ankle. Was admitted into Guy's from the workhouse, with diseased knee-joint of same limb, and of seven years' standing. Amputation of the thigh under chloroform was performed, eight days after admission. Tetanus set in eleven days after the operation, and after exposure to draught of air, which played freely on the bed, March 31st, 1857. Overcast; rain at intervals; S.E. and S., S.E., W.; temp. 44° to 51°. *Wound* granulating and discharging. *Symptoms:* Trismus, at first slight, for twenty-four hours, then rapidly acute; severe general spasms. Stimulants; support; turpentine enemata. Since the operation he took fourteen ounces of wine and eight ounces of brandy daily. *Death* in sixty hours,—spasm, suffocation. *Post-mortem*, six hours after: Head not examined; sciatic nerve two inches exposed in wound and quite healthy, granulation over it; heart, right side distended with dark fluid blood,—left, firmly contracted; lungs, strumous tubercles, indurated apex; intestines healthy; spleen large, soft, and full of blood.

In analysing and reviewing the foregoing cases, we shall adopt the following order:

1. The frequency of the disease. { 1. In reference to hospital admissions. 2. „ „ deaths.
2. The sex.
3. The age.
4. The constitution, diathesis, regimen, and habits. } Condition of body.
5. Season of year, climate, &c. Condition of atmosphere. } Predisposing causes.
6. The form of the disease. { 1. *Idiopathic.* Exposure. 2. *Traumatic.* { 1. Acute. 2. Subacute. 3. Chronic. } } Exciting causes.
7. Interval between probable cause and the first appearance of symptoms.
8. The state of the wound at the time of occurrence of symptoms.
9. The peculiarity of the symptoms. { 1. Premonitory. 2. Specific. 3. Decline.
10. Duration of the disease; ratio of recovery and mortality; the mode of dying; and prognosis.
11. The morbid appearances.
12. The treatment adopted. { 1. Local. 2. Constitutional.

Section I.—The Frequency of the Disease.

Ratio of Cases of Tetanus to Hospital Admissions and Hospital Deaths.

The following table will fully show the comparative rarity of this disease in a large London hospital. The average yearly number of cases of tetanus being $2\frac{1}{4}$ in total average yearly admissions of 3532 cases; and the cases of deaths from tetanus being a little less than 2 in total average yearly deaths of $345\frac{3}{8}$ cases.

Table of the Number of Cases of Tetanus occurring in Guy's Hospital since the Year 1825, *compared with the number of Admissions and Deaths in the respective Years.*

Years.	Admissions.				Deaths.			
	Medical.	Surgical.	Total Admissions	No. of Cases of Tetanus.	Medical.	Surgical.	Total Deaths.	Tetanus —Died.
1825	955	1584	2539	2	157	112	264	2
1826	1030	1636	2666	1	173	122	295	1
1827	982	1792	2774	3	148	134	282	2
1828	864	1652	2516	1	143	103	246	1
1829	948	1637	2585	1	161	136	297	1
1830	1058	1545	2603	2	157	149	306	2
1831	1370	1909	3279	2	207	138	345	2
1832	1294	1749	3043	—	179	108	287	—
1833	1365	1730	3095	—	161	109	270	—
1834	1465	1930	3395	1	175	125	300	—
1835	1448	1858	3306	1	203	118	321	—
1836	1433	2034	3467	2	195	111	306	1
1837	1536	1906	3442	1	229	156	385	1
1838	1488	1887	3375	3	191	118	309	3
1839	1212	1807	3019	3	190	141	331	3
1840	1542	2104	3646	2	190	127	317	2
1841	1323	1979	3302	1	199	136	335	1
1842	1635	2039	3674	1	215	126	341	1
1843	1728	2029	3757	2	193	121	314	2
1844	1768	2142	3910	3	239	152	391	3
1845	1637	2170	3807	2	236	158	394	2
1846	1709	2080	3789	4	260	149	409	4
1847	1761	2283	4044	2	240	144	384	2
1848	1672	2100	3772	2	246	129	375	2
1849	1742	2082	3824	4	249	126	375	3
1850	1933	2232	4165	4	225	122	347	3
1851	2082	2539	4621	3	278	135	413	2
1852	1822	2054	3876	2	224	118	342	2
1853	1809	2363	4172	2	283	149	432	1
1854	2164	2472	4636	5	369	157	526	5
1855	1851	2455	4306	4	248	156	404	4
1856	2026	2589	4615	5	271	133	404	3
1857				1				1
Total . .	48,652	64,368	113,020	72	6834	4218	11,052	62

In the above table we have included 1 case of tetanus, occurring in the first quarter of 1857, to make up for the deficiency of the first quarter of 1825, and the absence of

returns for 1832, 1833. It thus comprises 32 full years. During this period there have occurred 72 cases of tetanus in Guy's Hospital, in 113,020 total admissions, being about 1 in 1570, and making an average of ·006 per cent.; and there have been 62 deaths from tetanus in 11,052 total deaths, making 1 in every 178 deaths, or ·056 per cent.

Now this mode of analysis may be reasonably objected to inasmuch as the majority of cases occurred among the surgical patients, and were admitted in consequence of a previous or coexisting lesion of surface; and in order to render the statistics, as far as possible, correct, we must consider the number of cases admitted among the medical patients, and also the nature of the supposed cause of the disease. Of the 72 cases, 10 were admitted under the physicians in 48,652 medical admissions, being 1 in 4865; and bearing a ratio of 13·888 per cent. of all the cases of tetanus. The following is the list of these cases:

Case 4.—	1827	Traumatic; bite of dog; chronic; recovery.
„ 9.—	1830	Traumatic; incised wound; acute; died.
„ 14.—	1835	Doubtful; abrasion, exposure; subacute; recovery.
„ 15.—	1836	Doubtful; jambed fingers, exposure; chronic; recovery.
„ 21.—	1839	Traumatic; healed wound; acute; died.
„ 28.—	1843	Traumatic; abrasion, gangrene; acute; died.
„ 29.—	1843	Idiopathic; exposure; acute; died.
„ 31.—	1844	Doubtful; slight prick, exposure; acute; died.
„ 56.—	1853	Idiopathic, no cause except diarrhœa; subacute; recovery.
„ 71.—	1856	Idiopathic; exposure; subacute; recovery.

Of these, all except Cases 29, 56, and 71 had a coexisting or previous lesion of surface; they were called traumatic, and hence might be ranked and included under the surgical class of cases, leaving only 3 genuine idiopathic cases to be placed among the medical cases. Thus, there will be 69 cases of tetanus with lesion of surface to 64,368 (+ 7) cases admitted with external lesion and surgical disease, being 1 in 932 cases, or ·0107 per cent.; and 61 deaths from tetanus to 4218 cases of death from injury and surgical disease, being 1 in 69, or 1·444 per cent.

This mode of reasoning is confined entirely to the assumption that the lesion was the exciting cause of tetanus, and therefore that the cases ought to bear their ratio and pro-

portion with similar diseases and injuries, which are only to be found in the surgical wards. But other observers, and among the rest, those conversant with the disease in India, do not look upon lesions as the cause, but only as coexisting circumstances, regarding the disease as originating from sudden changes from heat to cold.

Be this as it may we will take both sides of the question, and give the ratio—1st, to total admissions; and 2d, to total surgical admissions only.

A. *Respecting the ratio of cases to total hospital admissions.*

The Bombay Hospital is the only hospital besides Guy's where a return has been made on this point, but it comprises a small period. With respect to the admissions—

Mr. Peat states that from 1845 to 1851, being seven years, there were 195 cases of tetanus to 26,719 admissions, but this return excluded about 70 or 80 more which occurred in the hospital, and were classed under the original injury or disease.

Dr. Morehead gives a return from the same hospital during the years 1848 to 1853, and states the average during that period to be 0·8 per cent. His returns give 204 cases of tetanus; and their ratio to total hospital admissions were in—

1848	0·8	per cent.
1849	0·5	,,
1850	0·7	,,
1851	0·9	,,
1852	0·8	,,
1853	1·1	,,

Comparison of the several returns:

GUY'S HOSPITAL.

32 Years.	113,020	Total admissions.	72	Cases, being	1 in	1570	or ·0063 pr. cent.
32 ,,	64,368	Surgical admissions.	69	,, ,,	1	932	or ·0107 ,,
*6 ,,	24,430	Total admissions.	17	,, ,,	1	1437	or ·0069 ,,
1848–1853	13,370	Surgical admissions.	16	,, ,,	1	835⅝	or ·0119 ,,

BOMBAY.

*6 Years. 1848 to 1853. Cases of Tetanus to Total Hospital admissions, 0·8 per cent.

* All of the same period.

B. *Respecting the average proportion of deaths from tetanus to total deaths, &c.*

GUY'S HOSPITAL.

32 Years.	11,052 Total deaths.	62 Cases, being	1	in 178	or ·056	per cent.
32 „	4,218 Surgical deaths.	61 „ „	1	69	or 1·444	„
*6 „	2,284 Total deaths.	13 „ „	1	175	or ·056	„
1848—1853.	779 Surgical deaths.	13 „ „	1	60	or 1·668	„

BOMBAY.

*6 Years.	1848 to 1853. Cases of death from Tetanus to Total Hospital deaths					3·9	per cent.
1848	„	„				3·4	„
1849	„	„				2·2	„
1850	„	„				2·5	„
1851	14,724 Total deaths.	332 Cases, being	1	in 44	or 2·39	„
1852	13,763 „	341 „ „	1	40	or 2·47	„
1853	14,164 „	239 „ „	1	59	or 1·68	„

Dr. Leith, Registrar of Deaths at Bombay, returns 1716 deaths from tetanus, from 1848 to 1852, and states the per centage to be 2·5 on total deaths from all causes.

The following returns are taken from the Registrar-General of England :

I. LONDON.

		Deaths from Tetanus.		
1843	48,574 Total deaths.	4 Under five years of age.[1]	13 Five years and over.	
1844	50,423 „	2 „ „	26 „	„
1845	48,332 „	5 „ „	15 „	„
1846	49,089 „	7 „ „	12 „	„
1847	60,442 „	3 „ „	11 „	„
1848	57,625 „	4 „ „	9 „	„
1849	68,755 „	4 „ „	20 „	„
1850	48,557 „	6 „ „	12 „	„
1851	55,488 „	7 „ „	12 „	„
1852	54,638 „	6 „ „	15 „	„
1853	60,069 „	7 „ „	8 „	„
1854	73,697 „	4 „ „	16 „	„
12 Yrs.	675,689 „	59 „ „	169 „	„

* All of the same period.

[1] We have here purposely separated the cases of tetanus occurring under five years of age, in order that comparison may be made with hospital returns; still we have given both per centages with and without these cases further on.

II. England.

1847	420,977 Total Deaths.	165 Deaths from Tetanus.	
1848	398,553 „	131 „	„
1849	440,839 „	134 „	„
1850	368,602 „	115 „	„
1851	395,396 „	118 „	„
1852	407,135 „	145 „	„
1853	421,097 „	116 „	„
1854	437,905 „	180 „	„
8 Years	3,290,484 „	1104 „	„

Thus:

In London.

			Per cent.
12 Years.	675,689 Total deaths.	228 Cases, all ages, being 1 in	2963 or ·0033.
12 „	„ „	169 „ 5 yrs. and over „ 1	3998 or ·0025.
6 „ 1848-1853	345,132 „	110 „ all ages, „ 1	3137 or ·0031.
	„ „	73 „ 5 yrs. and over „ 1	4714 or ·0025.

In England.

			Per cent.
6 Years 1848—1853.	2,431,602 Total deaths.	759 Cases, all ages, being 1 in	3203 or ·0031.

But in reverting to the above list, we find that in 1847 and in 1854, years excluded for comparison with the Bombay and other returns for the period, a very large majority of cases occurred, rendering the return as follows:

			Per cent.
8 Years.	3,290,484 Total deaths.	1104 Cases, all ages, being 1 in	2980 or ·0033.

Resumé of the 6 years, 1848 to 1853:

Guy's Hospital	·056	per cent. of Total deaths.
London	·0025	„ „
England	·0031	„ „
Bombay	3·9	„ „

The difference between the returns from Guy's Hospital and the London returns is readily explained by the latter including all deaths of infancy, old age, and from other causes which do not find admission in the wards of a London hospital.

Section II.—The Occurrence of Tetanus in the two Sexes.

Of the 72 cases in Guy's Hospital:

12 *were females*—all traumatic, and all fatal; 5 supervened on burns, 3 on incised wounds, 3 on lacerated wounds, and 1 on ulcer of the neck; ages varying from 8 to 41.

60 *were males*—50 died, 1 idiopathic and 49 traumatic, ages from 8 to 70; 10 recovered, 2 idiopathic, 5 idiopathic and traumatic, and 3 traumatic—1 acute and 2 subacute.

Mr. Peat in his report gives very little information on this point; he says that but few females were treated in the hospital, there not being more than 600 admitted during the year, so that he can offer no satisfactory deduction. In the 61 tabular cases that are appended to his report, there are no less than 7 females included, all died; 5 were traumatic, 1 after abortion, and 1 after parturition.

The following may be taken as a fair estimate:

	Cases.	Males.	Females.		
Guy's Hospital	72	60	12	being	5 to 1
Glasgow Cases	52	42	10	„	$4\frac{1}{5}$ to 1
Published Cases, collected by Dr. Lawrie (traumatic only)	171	144	27	„	$5\frac{1}{3}$ to 1
Mr. Curling's Cases, included in the latter, but taken separately	128	112	16	„	8 to 1

The first two are the only proper sources for legitimate deduction, as the Published Cases and Mr. Curling's are to be considered as selections only.

We have placed here a table showing the relative proportion of cases occurring in the sexes among the total cases in Guy's Hospital for the years 1854, 1855, and 1856:

1. *Surgical Department.*

		Cases Admitted.	Cases.	Total Deaths.	Deaths from Tetanus.	Recovery.
Males.	1854	1619	4	118	4	–
	1855	1542	2	99	2	–
	1856	1591	4	93	3	1
		4752	10	310	9	1

		Cases Admitted.	Cases.	Total Deaths.	Deaths from Tetanus.
Females .	1854	853	1	39	1
	1855	913	2	57	2
	1856	998	0	40	0
		2764	3	136	3

Males . . . . 1 in 475$\frac{3}{10}$ or ·0204 per cent.
Females . . . 1 in 921$\frac{1}{3}$ or ·0108 „

2. *Medical Department*—1 male case occurred in 1856 out of 1149 medical male admissions for that year, idiopathic and subacute, with recovery.

The Registrar-General of England returns the following proportions of the deaths of sexes from this and other causes :

I. London.—A. *Males.*

			Deaths from Tetanus.	
1843	24,961	Total deaths.	3 Under five years.	11 Five years, and upwards.
1844	25,729	„	2 „	22 „
1845	24,496	„	3 „	9 „
1846	24,941	„	5 „	11 „
1847	30,347	„	1 „	7 „
1848	29,329	„	3 „	6 „
1849	34,167	„	3 „	18 „
1850	24,427	„	2 „	7 „
1851	28,140	„	4 „	9 „
1852	28,063	„	2 „	7 „
1853	30,852	„	3 „	8 „
1854	37,151	„	1 „	9 „
12 Yrs.	342,603	„	32 „	124 „

B. *Females.* London.

			Deaths from Tetanus.	
1843	23,613	Total deaths.	1 Under five years.	2 Five years, and upwards.
1844	24,694	„	0 „	4 „
1845	23,836	„	2 „	6 „
1846	24,148	„	2 „	1 „
1847	30,095	„	2 „	4 „
1848	28,296	„	1 „	3 „
1849	34,588	„	1 „	2 „
1850	24,130	„	4 „	5 „
1851	27,348	„	3 „	3 „
1852	26,575	„	4 „	8 „
1853	29,217	„	4 „	0 „
1854	36,546	„	3 „	7 „
12 Yrs.	333,088	„	27 „	45 „

II. ENGLAND.—8 *Years, from* 1847 *to* 1854, *including all Ages.*

	MALES.	Deaths from Tetanus.	FEMALES.	Deaths from Tetanus.
1847	213,076	125	207,901	40
1848	202,265	94	196,268	37
1849	221,801	100	219,038	34
1850	186,284	73	182,318	42
1851	200,500	77	194,896	41
1852	207,042	90	200,093	55
1853	214,720	82	206,377	34
1854	222,422	93	215,483	87
	1,668,110	734	1,622,374	370

From these returns, the following deductions are made:

In London, from 1843 to 1854, the proportion of males to females dying of tetanus was—

156 to 72, being $2\frac{1}{8}$ to 1.

In England, from 1847 to 1854—

734 to 370, being nearly 2 to 1.

Now if we exclude those cases where death occurred under 5 years of age, we shall have the following modified proportion, and which will be more compatible to arrange side by side with the hospital returns; these we subjoin according to deaths.

In London, from 1843 to 1854, cases of death from tetanus at 5 years and upwards were—

	124 Males	to	45 Females,	being about	$2\frac{3}{4}$ to 1.
In Guy's Hospital	50 „		12 „	„	$4\frac{1}{2}$ to 1.
Glasgow.	37 „		8 „	„	$4\frac{5}{8}$ to 1.
Published Cases	71 „		9 „	„	nearly 8 to 1.

By thus comparing these several averages we can the better arrive at some more definite idea of the prevalence of the disease in the two sexes, and conclude that it is not so great as is generally imagined.

The relative proportion of deaths from tetanus to total deaths in the different sexes in London and England are—

A. London.

Males—Total Cases . . 1 in 2196	Females—Total Cases . . 1 in 4626
„ —Æt. 5 yrs. & upwards 1 in 2762	„ Æt. 5 yrs. & upwards 1 in 7401

B. England.

Males—Total Cases . . 1 in 2272	Females—Total Cases . . 1 in 4384

Section III.—Table of the Ages in which Tetanus occurred.

Returns.	Under 5 Years.		5 and under 10		10 and under 20		20 and under 30		30 and under 40		40 and under 50		50 and under 60		60 and under 70		70 and under 75		Total.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M	F.	M.	F.	M.	F.
Guy's	—	—	2	3	13	3	10	3	17	2	9	1	5	—	3	—	1	—	60	12
Glasgow . . .	—	—	2	1	11	3	12	1	7	3	5	1	3	—	—	—	—	—	40	9
Published Cases . .	2	—	7	1	33	5	38	8	20	4	21	5	2	3	3	—	1	—	127	26
Deaths from Tetanus in London, 1843—1854.	32	27	12	5	21	8	23	9	19	8	29	1	10	6	7	6	3	2	156	72

Mr. Peat returns his Bombay cases under the following headings:

Cases between	5	and	9	Years . . . . . 6 Cases.
„	9	„	15	„ . . . . . 12 „
„	15	„	25	„ . . . . . 46 „
„	25	„	35	„ . . . . . 63 „
„	35	„	45	„ . . . . . 30 „
„	45	„	55	„ . . . . . 3 „
„	55	„	65	„ . . . . . 6 „
				166

Thus there were, of—

72	Guy's Hospital Cases . .	29	or about	40·27	per cent. between	10 and 30.
49	Glasgow Cases	27	„	55·1	„ „	10 „ 30.
153	Published Cases, comprising Traumatic only . .	84	„	54·9	„ „	10 „ 30.
166	Bombay Cases	109	„	65·66	„ „	15 „ 35.
169	Registrar-General, London, omitting those under 5 Years	61	„	36·09	„ „	10 „ 30.

Section IV.—Constitution, Diathesis, Condition of Body, Habits, and Previous Health.

The majority of the cases of tetanus are in good health, such is the general opinion. We shall see how far this assertion is borne out in reference to the Guy's Hospital cases.

Sufficient attention has not been paid to any one of the above points, as may be fully seen in the accompanying remarks upon each separate item.

In investigating effects and endeavouring to trace them to their proper and appropriate cause, every possible point must be adverted to, even to the minutest detail or circumstance. Hence the value of true and accurate reports to ensure a safe and correct conclusion and deduction.

a. Constitution and Diathesis — recorded in 15 cases only.

1. *Strong.*—5 cases, Nos. 20, 39, 40, 64, 68; recorded as strong, robust, and healthy; of ages of 8, 14, 33, 40, and 53; all males; all died—1 in 24 hours, 1 in 4 days, and 3 in 7 days.
2. *Very irritable and excitable.*—4 cases, No. 1, 2, 50, and 67; 3 males, æt. 17, 35, and 37; all traumatic, and ending fatally in 40 hours, 4 days, and 14 days respectively; 1 female, æt. 23, traumatic, and fatal in 7 days.
3. *Plethoric.*—Only 1 case mentioned, No. 9, a female, æt. 30; traumatic, and death in 21 days.
4. *Phlegmatic.*—Also only 1 case, No. 11, male, æt. 30; traumatic, and death in 19 days.
5. *Quiet disposition.*—1 case, No. 21, male, æt. 10; traumatic, and death in 12 days.
6. *Cheerful.*—1 case described as such, No. 34, female, æt. 8; traumatic, and death in 5 days.
7. *Fair.*—1 case, No. 56, a male, æt. 23; idiopathic; recovery. There are two others recorded as being fair, but included under strong; both males, and fatal.
8. *Strumous*, very.—No. 72; male, æt. 22; death in 60 hours.

Thus, of the 15 cases in which the condition and diathesis have been recorded, 14 were traumatic, 11 males and 3 females, and all died; 1 idiopathic, not acute, a male, and recovered. The very quiet and cheerful, the very irritable and excitable,

the strumous and fair, and the very strong, alike equally liable and alike equally fatal. The duration of the disease does not seem to be at all modified.

The return stands thus :

	Recovered.		Died.
Strong . .	0	...	5
Very irritable and excitable	0	...	4
Plethoric . .	0	...	1
Phlegmatic . .	0	...	1
Quiet disposition .	0	...	1
Cheerful . .	0	...	1
Fair . . .	1	...	0
Strumous . .	0	...	1
	1		14

Respecting the constitution, J. Hunter remarks, "But everything relative to lock-jaw does not arise from irritation of the wound itself, neither from inflammation nor symptomatic fever; for in such states the constitution is not disposed to it. It arises from an irritable habit, which may be increased or produced by irritation, but not such as is capable of producing inflammation. There must be a disposition for the disease; thus madness is produced from the slightest causes when the mind is predisposed; so it is in agues and fevers, the constitution being particularly predisposed at the time to such diseases."

B. Condition of Body—noticed in 46 cases.

1. *Healthy.*—18 cases, Nos. 15, 19, 20, 21, 23, 28, 32, 34, 36, 39, 58, 59, 64, 65, 68, 69, 70, and 71.

Of these 2 were females, æt. 8 and 9; both traumatic, and both fatal, 1 in 50 hours and 1 in 5 days.

Of the 16 males, 1 was idiopathic, not acute, in a person æt. 23, who recovered in about 29 days. 15 were traumatic; 2, æt. 29 and 53, recovered; the remaining 13 died, the shortest period being 19 hours, and the most protracted one 14 days, ages varying from 8 to 47.

The precise periods are—1 in 19 hours, aged 42
1 in 24 „ „ 20
3 in 4 days „ 40, 46, and 47
3 in 6 „ „ 11, 13, and 32
3 in 7 „ „ 8, 14, and 30
1 in 12 „ „ 10
1 in 14 „ „ 22

Thus, of 18 cases recorded, 3 recovered, 1 being idiopathic; 15 died, all traumatic.

2. *Unhealthy.*—3 cases, Nos. 2, 24, 72. All traumatic and males, æt. 17, 22, and 24; all died, in 40 hours, 50 hours, and 12 days respectively.

3. *Muscular and fine made.*—11 cases, Nos. 3, 8, 13, 15, 26, 28, 29, 32, 41, 67, and 70. All males; 2 recovered, and 9 died.

Idiopathic.—1 case, æt. 40, who died in 8 days.

Traumatic.—10 cases; 2 recovered, æt. 24 and 29; 8 died—

1 in 19 hours, aged 42
1 in 2 days, „ 41
1 in 3 „ „ 30
2 in 4 „ „ 35 and 47
1 in 5 „ „ 24
1 in 7 „ „ 40
1 in 14 „ „ 22

4. *Robust and well developed.*—6 cases, Nos. 11, 17, 40, 46, 58, and 66. All traumatic, and all fatal.

2 females—æt. 46, who died in 7 days; æt. 24, fatal in 6 days.

4 males, æt. 11, 30, 30, and 33, and fatal in 6, 5, 19, and 7 days respectively; one of whom was remarkably fat.

5. *Spare.*—3 cases, Nos. 1, 33, and 36. All traumatic, and all fatal.

1 female, æt. 9, died in 50 hours.

2 males, both æt. 37, and died, 1 in 3 days and 1 in 14 days.

6. *Emaciated.*—5 cases, No. 27, 31, 55, 63, and 72. All traumatic, and all died.

2 females, æt. 9 and 11, and fatal, 1 in 4 or 5 hours, and 1 in 4 days.

3 males, æt. 13, 18, and 22; fatal in 4 days, 3 days, and 50 hours.

The return stands thus:

	Recovered.	Died.
Healthy . . .	3 ...	15
Unhealthy . . .	0 ...	3
Muscular and fine made .	2 ...	9
Robust and well developed	0 ...	6
Spare . . .	0 ...	3
Emaciated . . .	0 ...	5
	5	41

Separating these into classes, we find that the healthy, muscular, and fine made, and the robust and well developed, amount to 5 recoveries and 30 deaths; whereas the unhealthy, spare, and emaciated, comprise 11 deaths.

J. Hunter's remarks are not borne out by the foregoing. He says, "Those most susceptible to the disease are of weakly, delicate frames, and of suspicious minds, and not of strong and robust ones."

c. Habits—16 cases mentioned.

1. *Temperate.*—Adverted to in 7 cases, Nos. 20, 28, 48, 59, 67, 70, and 71. All males; 2 recovered, 5 died.

1 *idiopathic*, æt. 23, who recovered in 29 days.

6 *traumatic*, 1, æt. 24, recovered in 3 weeks;

5 died—2 in 4 days, æt. 35 and 47
1 in 6 „ „ 32
1 in 7 „ „ 40
1 in 14 „ „ 22

2. *Intemperate.*—6 cases, Nos. 5, 9, 24, 40, 46, 69. All traumatic; 5 died, 1 recovered;

2 females, æt. 30 and 41, who died in 21 and 7 days.

4 males, 1, æt. 53, recovered;

3 died—1 in 7 days, æt. 33
1 in 12 „ „ 24
1 in 22 „ „ 70

3. *Been living low.*—2 cases, Nos. 8 and 31. Traumatic; males; æt. 18 and 24, and fatal in 3 and 5 days.

4. *Dissipated.*—1 case, No. 72; male, æt. 22; death in 60 hours.

	Recovered.	Died.
Temperate . . .	2 ...	5
Intemperate . . .	1 ...	5
Living low . . .	0 ...	2
Dissipated . . .	1 ...	0
	4	12

Thus the dissipated and intemperate have an equal ratio with the temperate; 2 recoveries to 5 deaths.

It is impossible to draw any satisfactory conclusion from the foregoing facts, as collected from the meager and scanty materials, with regard to there being any particular condition of the individual which renders him peculiarly susceptible to the disease. In reference to the habits and constitution of individuals, Mr. Peat inquires whether the caste in the Bombay cases had any influence:

	Total Admissions.	Cases of Tetanus Admitted.	Cases of Tetanus Fatal.	Per cent.
Hindoos . . .	5817 ...	95 ...	64 ...	67·1
Mussulmans . .	4919 ...	54 ...	46 ...	85·2
Christians . .	2733 ...	21 ...	13 ...	61·9
Parsees . . .	1193 ...	12 ...	5 ...	41·6

Dr. Morehead observes, that from 1838 to 1845, whilst

attending the *European* General Hospital at Bombay, and in medical charge of the Jail, House of Correction, and Byculla schools, only 3 cases of tetanus came under his notice; 2 idiopathic—1 in a European, æt. 12, the other in a sailor; 1 traumatic, in a young English merchant; whilst, during nine years, from 1845 to 1853, 289 cases of tetanus came under his notice in the Sir Jamsetjee Jejeebhoy Hospital. He also adds that out of 311 fatal cases in Bombay there were only 2 instances of Europeans being attacked; these were traumatic.

From these circumstances it appears that Europeans, whether in their own country or in India, are peculiarly exempt from the disease, whilst natives of warm climates are greatly susceptible. Is this, as Mr. Travers observes, owing to their being of a more relaxed fibre and greater susceptibility of impression, both external and internal; or, in other words, that less resistance is opposed to morbid action, and that in them disease runs its course with greater vehemence and rapidity than those of temperate regions?

J. Hunter remarks, "that climate seems the first of the predisposing causes, and that which can probably produce it without other causes. In warm climates it is most frequent. The cramp is most frequent in warm climates, and also in bed; fits also are more frequent in bed, for warmth seems to have a peculiar effect in producing a particular disposition in the nerves; and when there is an immediate slight cause, such diseases readily take place; nay, some are disposed to such action without any immediate cause, which probably arises from climate, joined with a very strong natural predisposition."

D. Previous Diseases, Injuries, Complications, &c.

These points have been but little considered in estimating the causation, severity, and form of the disease, as is evidenced by the small number of notices taken thereof, there being only 12 out of the 72 cases.

1. *Epilepsy.*—2 cases were the subject of this disease, Nos. 18 and 38.

A male, æt. 18; tetanus followed a severe laceration of the leg 19 days after, and was fatal in 40 hours.

A female, æt. 25; tetanus followed a severe burn 21 days after, and came on a few days before the expected epileptic seizure; death in 4 days.

Epilepsy is a close ally of tetanus, so far as spasmodic action is concerned, but whether it had any co-operation in hurrying on the tetanus to a fatal termination in the 2 cases, we must leave to conjecture; certainly it cannot enter into the classes of causation, else should we feel disposed to expect a greater frequency of the disease in other cases of epilepsy.

2. *Rheumatism.*—3 cases, Nos. 50, 56, and 71.

1 female, æt. 23, of great nervous excitability, and had been subject to rheumatism; was attacked with acute tetanus in the hospital 16 days after the laying open of an inflamed bursa; fatal in 7 days.

2 males, both æt. 23; both idiopathic tetanus, and mistaken for rheumatism before admission. One of these had smallpox 4 years before, and made a good recovery; the other had scarlet fever 2 years before, and hoarseness during a few months previous to the attack. Both recovered.

Rheumatism.—Tetanus is very often ushered in by symptoms of rheumatism; stiffness of the muscles of the back of the neck is a very common symptom, and described by the patient as the result of exposure. In 2 cases of tetanus, both idiopathic, but subacute and chronic in their characters, they were treated for and considered to be rheumatism previous to admission. Rheumatism has, as its exciting cause, cold and moisture acting upon the body of a person previously heated, perspiring, and fatigued;—so has tetanus in many instances, and generally when of the idiopathic variety. The one developes itself in an inflammation of the muscular, tendinous, and ligamentous structure; the other confines itself to a spasmodic affection of the muscular system, probably influenced through the nervous system.

How far tetanus can be referred to exposure and atmospheric changes in all cases, as advanced by our Indian observers? and how far it is allied with rheumatism? are questions that have not yet been discussed with sufficient force.

3. *Chronic cough and palpitation.*—No. 32.

A male, æt. 42. Discharged from the army 2 years ago for the above complaint, having served 18 years. He met with a compound fracture from fall into a well with 15 inches of water in it. Attacked on sixth day, and fatal in 19 hours.

4. *Chronic laryngeal disease and recent bronchitis.*

A female, æt. 24; admitted with an ulcer over the face; attacked on the 7th day of admission, and fatal in 6 days.

5. *Ulcer*, in No. 66, is considered as a supposed exciting cause; in No. 29, a male, æt. 40, for 5 years subject to ulcers of the leg, which never discharged freely, was attacked with idiopathic tetanus; acute, and fatal in 8 days. If the ulcer was the cause, why did tetanus not attack him before the end of the fifth year? However, in this case there was distinct evidence of change of temperature as a cause.

6. *Strumous disease of joints.*—Case 72.

A male, æt. 22. Nine years ago he had amputation of the leg performed for diseased ankle, and recovered. Two years after the same form of disease attacked the knee on the same side; he was admitted into Guy's, and had the thigh amputated, followed by tetanus, and fatal in 60 hours.

7. *Previous injuries.*—2 cases, 28 and 69.

A male, æt. 22, fractured his leg nine months ago, and followed by speedy union. Now had abrasion of finger, with subsequent gangrene from exposure to cold, followed by tetanus on the third day, and fatal in 14 days.

A male, æt. 53, was jambed by the pole of a carriage against a fence, about nine months before the attack; he was struck over the lower part of the sternum, and suffered much from dyspnœa and cough, keeping his bed for four or five days. He recovered. He met with a lacerated wound over the nose about nine days before the attack, but was exposed to wet and damp previous to the symptoms setting in.

If these patients were predisposed by a peculiar condition of constitution and nervous irritation, why did not tetanus make its appearance with the first instances of injury? However, in both these cases we had atmospheric complication, which in all probability brought the disease into play.

8. *Complicated with worms.*—2 cases, Nos. 21 and 36.

A boy, æt. 10; tetanus set in 4 days after fall whilst sliding; and 1 month after an incised wound of finger, which had cicatrized. Admitted on 5th day of attack. Passed 2 long round worms 3 days after admission. Symptoms severe; fatal in 7 days.

A girl, æt. 9; admitted with severe burn; attacked by tetanus on 10th day, severe and acute; death in 50 hours. A few ascarides found in the rectum.

Section V.—Season of the Year and Climate, &c.

Before entering into the consideration of this part of the subject, we have thought necessary to isolate and place in detail the several recorded facts as observed in the cases at Guy's Hospital with reference to the month, date, state of the weather, and temperature, when tetanus supervened. The condition of the weather and the state of the tempera-

ture, perhaps, cannot be made use of, or relied upon for any practical or theoretical purpose; inasmuch as the exciting or predisposing causes, if atmospheric at all, seem to depend not upon the actual state of the weather and temperature at or about the time of occurrence, but upon the sudden changes from heat to cold, or *vice versâ*, at different periods of the day. However, be this as it may, the facts are here again brought forward, so as to render the report as complete as possible. These are taken from the meteorological tables of the Royal Society up to Case 29; the remainder from the register kept by the Horticultural Society at Chiswick; they indicate the temperature and weather at the time of and for the two or three days previous to the attack. We have also considered it necessary to repeat the supposed exciting cause and other facts, for a more satisfactory comparison.

JANUARY.—Six cases, all traumatic and all fatal.

	Symptoms on the		Temperature.	
1.	1st, 1848	Wind and rain . . .	39° to 48°	S.E., N.E., S.
2.	15th, 1841	Slight rain and wind .	35° to 47°	N.W., N.E., S.
3.	17th, 1839	Fine	30° to 37°	W.N.W., W., W.
4.	25th, 1856	Wind and rain . . .	39° to 48°	S.W., S.S.W., S.W.
5.	31st, 1839	Fine	27° to 32°	W., S.W., W.
6.	31st, 1845	Frosty; boisterous wind	22° to 35°	N., S.W., W.

All of these, except the fifth on the list, had the disease supervene previous to admission, and therefore were, in all probability, exposed to the atmospheric changes of wind and rain prevalent at the time. In No. 3 case the weather is mentioned as being fine, and tetanus supervening four days after a fall whilst sliding, but he had cut his finger a month before this, and the wound was perfectly cicatrized; although the latter was attributed to be the cause, it is more than probable that the fall on the ice was the real excitor. No. 1 had a wound over the brow, followed by tetanus on sixth day, and admitted on second day of attack. No. 2 met with compound fracture of the finger; three days after he was attacked, and admitted on the second day of the disease. No. 4 had a lacerated finger, and twelve days afterwards he was attacked, and admitted on second day of the disease. No. 6 had a crushed finger, followed on sixth day by tetanus; admitted on second day of attack and had finger amputated.

No. 5 case supervened whilst in the hospital, fifteen days after admission for compound fracture of the fingers, requiring amputation for gangrene on the ninth day, and use of metallic sutures the day previous to the attack.

FEBRUARY.—Two cases, both traumatic and both fatal.

	Symptoms on the		Temperature.	
1.	8th, 1843	Sharp frost; snow, wind, and rain previously	34° to 38°	E., N., N.W.
2.	25th, 1849	Rain; thunder; boisterous	34° to 51°	N.W., N.W., W.

These cases were attacked before admission; the first had abrasion of the finger followed by gangrene thereof, and gangrene of the toes owing to exposure from cold, and admitted on ninth day of attack; the second admitted on same day of attack, and followed a punctured wound of the foot received nine days previously.

MARCH.—Four cases, traumatic, 3 fatal and 1 recovery.

	Symptoms on the		Temperature.	
1.	3d, 1856	Slight rain	44°	N.E., N.E., N.E.
2.	9th, 1854	Overcast; frosty	48° to 63°	S.W., S.W., S.W.
3.	26th, 1836	Cloudy; light rain	42° to 49°	S.W. var., S. var., S. var.
4.	31st, 1857	Overcast; rain; windy	44° to 51°	S.E. & S., S.E., W.*

Two, Nos. 2 and 3, were attacked previous to admission. No. 2 admitted on the fourth day of attack, and supervened fourteen days after amputation of a crushed toe. No. 3 had been exposed to wet and damp previous to his injury, viz., jambed fingers, the symptoms coming on twelve days after, and admitted on tenth day of attack; he recovered.

Two, Nos. 1 and 4, were attacked whilst in the hospital. No. 1 six days after admission for lacerated finger, requiring amputation under chloroform. No. 4 supervened eleven days after amputation of thigh for diseased knee-joint, having been in hospital eight days previously; there was a good deal of cold wind at the time, the windows of the ward were left opon for ventilation early in the morning of the attack, and cold air played freely over the patient's bed. Both these cases were acute and rapidly fatal.

APRIL.—Six cases, 5 fatal and 1 recovery.

	Symptoms on the		Temperature.	
1.	9th, 1844	Very fine and hot . .	29° to 73°	W., S.W., N.E.
2.	10th, 1852	Fine	41° to 54°	E., S.E., E.
3.	14th, 1855	Fine	57° to 62°	W., S., S.W.
4.	14th, 1855	Fine	57° to 62°	W., S., S.W.
5.	25th, 1849	Fine	44° to 62°	W., N., S.W.
6.	29th, 1843	Rain and wind . . .	49° to 55°	W., E., N.W.

Two admitted with tetanus. No. 1 on the third day of attack, following a crushed finger; and No. 6 on the fourth day; this was idiopathic, and consequent upon exposure to a gust of cold air on body while heated; both acute and fatal.

Four were attacked whilst in the hospital. No. 2 had tetanus six days after admission for compound fractured fingers with gangrene, the injury having been inflicted six days previously. Nos. 3 and 4 had tetanus at the same time in the hospital, but were in different wards; No. 3, a female, æt. 9, admitted with severe burn nine days previously; No. 4, a male, æt. 8, admitted for compound fracture of metacarpal bones ten days previously; they were both acute and fatal. No. 5, a questionable case, but published as one of tetanus; symptoms of trismus and affection of the respiratory muscles coming on twelve days after admission, for lacerated wound of leg and exposure of post. tibial nerve; amputation of the limb relieved the symptoms, which entirely subsided, but the patient died fifteen days afterwards from phlebitis.

MAY.—Five cases, 4 fatal and 1 recovery.

	Symptoms on the		Temperature.	
1.	4th, 1830	Clear; cloudless; light, brisk wind	57° to 62°	E., N., W.
2.	4th, 1853	Constant rain . . .	39° to 55°	E., E., E.
3.	14th, 1850	Fine	41° to 59°	S.W., N.E., N.W.
4.	16th, 1853	Very fine . . .	47° to 69°	E., S.E., E.
5.	24th, 1840	Fine; light wind . .	61° to 64°	S.W. var., W., N.W.

Nos. 1, 2, 4, and 5 admitted with tetanus. No. 1 met with an incised wound over the thumb, and followed three days after by tetanus; he was admitted on the fifteenth day of the disease, and died six days after admission. No. 2 was idiopathic, and stated to have had no exposure or injury, al-

though the weather is recorded to have been "constant rain" at the time of accession; he was admitted on the fifth week of the attack and gradually recovered. No. 4 had a lacerated finger, and one month after the phalanx was exposed and removed by forceps; followed by tetanus on the same day, and admitted on fourth day of the attack. No. 5 met with a slight graze above the elbow, followed by tetanus on 7th day, and admitted on seventh day of the attack.

Only one, No. 3, had tetanus supervene after admission. He had compound dislocation of the wrist, with fractured radius, and was attacked on the fifth day.

JUNE.—Twelve cases, 11 fatal, 1 recovery.

	Symptoms on the		Temperature.	
1.	12th, 1847	Great heat . . .	74°	S.W., W., N.W.
2.	16th, 1829	Cloudy; rain . . .	60° to 76°	N.W., W.S.W., S.W.
3.	16th, 1848	Fine	54° to 82°	S., E., S.
4.	19th, 1842	Heavy rain and wind . .	35° to 47°	S., E., S.
5.	20th, 1851	Very fine . . .	59°	S.W., S.W., W.
6.	22d, 1851	Very fine . . .	41° to 67°	N.W., N.E., S.W.
7.	24th, 1856	Rain; overcast . .	68°	W., N.E., N.W.
8.	25th, 1838	Fine; light winds . .	68° to 71°	N.N.W., E., N.W.
9.	25th, 1854	Fine	81°	S., S.W., S.W.
10.	27th, 1844	Fine	50° to 58°	N., N., S.W.
11.	28th, 1845	Heavy showers . .	43° to 69°	W., S.W., W.
12.	29th, 1846	Fine; warmer than usual .	57° to 76°	S.W., S.W., S.W.

Seven were admitted with tetanus, Nos. 2, 3, 4, 7, 10, 11, 12; four of these, Nos. 2, 4, 7, 10, have direct reference made to the atmospheric changes as a probable causation. No. 2 had a rusty nail enter his foot, and four days after, whilst heated, he bathed in the river, and was attacked with tetanus on the following day, and admitted on fourth day of the attack. No. 4 received a punctured wound of the foot whilst bathing; he bathed two or three times afterwards, and was attacked four days after the wound; he was admitted also on the fourth day of the disease. No. 7 had a lacerated wound over nose, and got wet through, and was much exposed afterwards; the symptoms came on nine days after the wound, and he was admitted on the fifth day of the attack; he recovered. Nos. 3, 11, 12, were traumatic. No. 3, deep lacerated wound of sole of foot, the symptoms came on six days after,

and was admitted on second day of attack. No. 11 had compound fracture of the humerus, followed by tetanus two days after, and admitted on fifth day of the disease. No. 12, wound of foot by rusty nail; symptoms on third day, and admitted on second day of attack.

Five had tetanus take place after admission, Nos. 1, 5, 6, 8, 9. No. 1 admitted with lacerated wound of hand, and attacked ten days after. No. 5 admitted with crushed forearm, followed by gangrene and spontaneous separation, assisted on thirteenth day by division of ligaments and median nerve, and attacked six days after the operation and nineteen days after admission. No. 6 admitted with lacerated wound about ankle, and attacked fourteen days after admission, just two days after the former case. No. 8 admitted with severe laceration of the leg, and was the subject of epilepsy; the attack came on nineteen days after. No. 9 admitted with a compound fracture of the thumb, with severe laceration; attacked eleven days after.

JULY.—Six cases, all traumatic and all fatal.

	Symptoms on the		Temperature.	
1.	5th, 1825	Cloudy and hazy; north winds	65° to 70°	W., N.E., W.
2.	13th, 1855	Heavy rain . . .	59° to 78°	S.W., N.W., N.
3.	22d, 1851	Fine	61°	E., W., S.W.
4.	24th, 1854	Sultry; very hot . .	85°	S.E., S., S.W.
5.	31st, 1838	Fine; rained heavily two days before.	61° to 67°	S., S.W. var., S.
6.	31st, 1840	Fine; slight rain; light winds .	62° to 70°	N.W., S.W., N.W.

Four were attacked before admission, Nos. 2, 4, 5, 6. No. 2, contused wound of foot from wheel passing over it, followed by tetanus ten days after, and admitted on second day of attack. No. 4 had abrasion of hand from scratch, followed by abscess of thumb and tetanus, admitted on second day of attack. Nos. 5 and 6 both had laceration of hand, and both had tetanus six days after, and both admitted on fifth day of disease.

The two cases, Nos. 1 and 3, were attacked after admission. No. 1 was admitted for a fall on iron railings, the spike entering the thigh, perforating the fascia; he was not attacked until the twenty-eighth day after. No. 3 admitted with lacerated

wound on the outer side of the knee, and attacked eleven days afterwards.

AUGUST.—Eight cases, traumatic; 5 died, 3 recovered.

	Symptoms on the		Temperature.	
1.	4th, 1850	Fine	59°	S.W., E., S.W.
2.	6th, 1856	Cloudless; calm . .	69° to 79°	E., N.E., E.
3.	11th, 1839	Fine	59°	S.W. var., S.W., S.S.W.
4.	13th, 1835	Excessively hot . .	69° to 82°	N.E., W., S.
5.	15th, 1834	Fair	63° to 73°	N.E., N.E., S.W.
6.	19th, 1838	Overcast . . .	62° to 69°	W., W.S.W., N.N.E.
7.	19th, 1849	Fine	50° to 72°	N., W., W.
8.	22d, 1850	Heavy rain, with frost at night .	39° to 66°	S.W., S., S.W.

Five were admitted with tetanus, No. 2, 4, 6, 7, 8. No. 2 had an iron spike enter the sole of the foot, followed by tetanus ten days after, and admitted on third day of attack. No. 4, tetanus supervened after exposure to great heat, and whilst in a state of perspiration, throwing off his jacket; there were, however, one or two excoriations on the fingers from friction, and was considered sufficient to warrant the case to be recorded as traumatic; under which it has been here so placed, although it is very evident that the true cause was the sudden change of temperature. No. 6 received a bite from a dog on right hand; attacked on twelfth day, and admitted on third day of attack. No. 7 had a crushed thumb; and five days after was attacked, and admitted on third day of the disease. No. 8 had a lacerated finger, followed by tetanus, and admitted on fourth day of attack.

Three cases were attacked after admission. No. 1 had a crushed finger, which was amputated at the time; he had some subsequent inflammation, for which he was admitted six days after the injury; but four days after being in the hospital he became exposed to cold, and was seized with tetanus; it assumed a subacute form, and had a successful issue. No. 3 was admitted with a compound dislocation of the ankle, with fracture of the astragalus, the upper part of which was removed; he was attacked seven days after. No. 5 was admitted with a compound fracture of the leg; the wound sloughed, and on second week a portion of tibia sawn off; tetanus came on on the twenty-seventh day after admission,

the patient referred it to exposure from the draught of a window, which was left open over his bed, two days previous to the attack; it was an acute case, and recovered.

SEPTEMBER.—Four cases, traumatic; 3 died and 1 recovered.

	Symptoms on the		Temperature.	
1.	7th, 1837	Fine brisk wind. . .	59° to 63°	S., N., E.
2.	11th, 1854	Very fine; cholera season .	73°	S.E., N.E., N.E.
3.	23d, 1827	Cloudy; showery; strong wind	55° to 57°	S.S.W., S.S.W., S.S.W.
4.	28th, 1831	Fine	61° to 67°	E., E., E.

Three, Nos. 1, 3, and 4, were admitted with tetanus. No. 1 on the fifth day of the attack, following five days after lacerated wound of the face, with fracture of the malar bone, and exposure by laying in a hay-loft all night after the injury. No. 3 had a bite from a dog, which subsequently formed an ulcer; and he was attacked on the tenth day after, and admitted on the eleventh day of the disease; he recovered. No. 4 had a lacerated finger, and fourteen days after fell fourteen feet and lacerated the scalp; three days after this he had tetanus, and was admitted on the fourth day of the attack.

One case, No. 2, was admitted with a lacerated wound of the foot, and had the attack eight days after.

OCTOBER.—Seven cases, 4 females and 3 males, all traumatic; all occurred after admission; all fatal.

	Symptoms on the		Temperature.	
1.	2d, 1855	Showery . . .	66°	W., S.W.
2.	5th, 1827	Fine; cloudy . . .	54° to 62°	N.N.E., S.S.W., N.N.E.
3.	5th, 1827	Fine and cloudy . .	54° to 62°	N.N.E., S.S.W., N.N.E.
4.	5th, 1844	Very fine . . .	41° to 70°	S.W., S.W., S.W.
5.	17th, 1825	Cloudy and rain . .	52° to 56°	W., S.W., W.
6.	18th, 1850	Very fine . . .	44° to 63°	W., S.W., W.
7.	23d, 1836	Light rain and high wind .	57° to 62°	E., E., E.S.E.

No. 1 was a female, admitted for an ulcer, the result of abscess on side of the neck; she had also chronic laryngitis and bronchitis; the symptoms occurred seven days after admission.

Nos. 2 and 3, male and female, were attacked the same time in the hospital, but in different wards; in the male, aged 70, it supervened ten days after admission for an extensive lacerated wound of the arm; the female, aged 15, was admitted for deformity after burn twelve years ago, and it came on on the twenty-first day after the operation of dividing the cicatrices in the fold of the axilla; she had been in the hospital about one month when she was attacked. No. 4 fell into a well thirty feet, where there were fifteen inches of water, and met with a compound fracture of the leg, for which he was admitted, and had tetanus on the sixth day. No. 5, admitted with jagged wounds of both heels, and also a fracture of the arm, he was attacked on seventh day after. Nos. 6 and 7 were both females, the one admitted for an inflamed bursa patellæ, which was laid open on the eighth day, and enlarged on the following day; fifteen days after this she had acute tetanus. The other was admitted with an extensive burn, and was attacked thirteen days after.

NOVEMBER.—Nine cases; 8 traumatic died, 4 males and 4 females; 1 idiopathic male recovered.

	Symptoms on the		Temperature.	
1.	5th, 1847	Rain, overcast, and very fine	44° to 56°	S., E., S.
2.	5th, 1849	Fine	42° to 53°	S.W., E., E.
3.	16th, 1846	Overcast; cloudy	39° to 48°	E., E., N.E.
4.	17th, 1856	Fine; sharp frost	27° to 34°	W., N., N.
5.	24th, 1852	Fine and rain	47° to 56°	N., S.W., E.
6.	25th, 1826	Clear; brisk wind	34° to 38°	S.W., S.W.
7.	27th, 1846	Dense fog	32° to 44°	S.W., S.W., S.
8.	29th, 1830	Overcast; light rains	42° to 43°	E.S.E., S.E., S.E.
9.	30th, 1846	Sharp frost	27° to 34°	N., N., N.

Five of these, Nos. 1, 2, 4, 6, and 8, were admitted with developed tetanus. No. 1 met with a strain of the back whilst carrying coals, and got wet through at the time; he sat for two hours in his wet clothes before a large fire, and on the following day he had stiff neck, but again went to work and got wet through; he was admitted on the fifth day of attack, and died. No. 2, a female, had a lacerated wound over the nose two months previously, which formed an unhealthy excavated sore, and was admitted on the second day of the attack. No. 4 was a genuine idiopathic case, following

direct exposure to cold; admitted on ninth day of attack, was subacute and recovered. No. 6 had a crushed finger, and eight days after was seized with tetanus, and admitted on the same day. No. 8 met with a lacerated wound above the ear, tetanus did not occur until four weeks after, and he was admitted a few days after the attack.

Four had tetanus come on after admission, Nos. 3, 5, 7, and 9, and three of these in same year, on the fifteenth, twenty-seventh, and thirtieth days of the month,—viz., No. 3 admitted for burn, and attacked on tenth day; No. 7 admitted for compound fracture of leg, and attacked on ninth day; and No. 9 admitted with burn, and subject to epilepsy, attacked on twenty-first day. No. 5 was admitted for burn, and attacked on ninth day. The burn cases were all females.

December.—Three cases, males; traumatic and fatal.

	Symptoms on the		Temperature.	
1.	2d, 1854	Clear and fine . .	46° to 51°	N.W., W.
2.	10th, 1828	Fine and clear . .	44° to 46°	W.S.W., S.W., S.W.
3.	14th, 1831	Rain and wind . .	42° to 45°	S.W., S.S.W., S.E., var.

Nos. 1 and 3 admitted with tetanus. No. 1 had abrasion of the finger, and followed on the eighth day by the disease, and was admitted on the second day of the attack. No. 3 received a punctured wound of the foot, and twenty-six days afterwards was exposed to cold for two nights, four days after which he was attacked with tetanus, and admitted on the twelfth day of the disease.

No. 2 was admitted with compound fracture of the leg, and was attacked seven days after.

We have thus given in full detail an analysis of the cases according to the months in which they occurred, and we have added the state of the weather and temperature at the time of its onset, in order that we might further investigate what share and influence these latter conditions might have as exciting or predisposing causes; but, in order to arrive at as satisfactory a conclusion as possible, we have isolated—1st, those cases that occurred previous to admission, and consequently were exposed to, and predisposed by, atmospheric changes, if any; and, 2d, those cases where the disease actually took place after admission

in the hospital, when it would be presumed that they would be little liable to wet and exposure and sudden change of temperature, from heat to cold, or *vice versâ*.

Of the 72 cases, 41 or 1 in $1\frac{3}{4}$ cases or 56·94 per cent. were admitted with the disease; and no less than 31 or 1 in $2\frac{1}{3}$ cases or 43·05 per cent. had tetanus supervene after admission.

I. *Cases admitted with tetanus.*—41 cases. Males, 37; 4 recovered and 33 died. Females, 4; all fatal.

June, 7.	July, 4.	March, 2.
January, 5.	May, 4.	April, 2.
August, 5.	September, 3.	December, 2.
November, 5.	February, 2.	October, 0.

Of these, 14 cases or 34·14 per cent. can be distinctly traced and associated with exposure and sudden change of temperature either as the original cause, and called idiopathic; or as the forerunner or direct antecedent of tetanus combined with a previous lesion, and called traumatic.

4 in June.	1 in March.	1 in September.
2 in November.	1 in April.	1 in October.
1 in January.	1 in May.	0 in July.
1 in February.	1 in August.	0 in October.

How far the remaining 27 cases were influenced we have no direct evidence recorded either one way or the other.

II. *Cases admitted for injury or disease and in whom tetanus set in afterwards.*—31 cases. Males, 23; 4 recovered, 19 fatal. Females, 8; all died.

October, 7.	August, 3.	May, 1.
June, 5.	March, 2.	September, 1.
April, 4.	July, 2.	December, 1.
November, 4.	January, 1.	February, 0.

In 3 of these cases there was direct evidence of exposure to draught and cold previous to the attack of tetanus; two occurred in the month of August, and one in the month of March. There was a questionable one in the month of October.

The following statement shows the number of days after admission and time after the injury or disease when tetanus set in:

1 case	4 days	after admission—	for inflamed stump after amputation of finger 6 days before. Day before attack was exposed to cold.
1 „	5	„	for compound dislocation of wrist with fracture.
3 „	6	„	1 for compound fracture of the leg from fall into a well with water in. 1 for compound fracture of fingers with gangrene. 1 for laceration of finger requiring amputation.
4 „	7	„	1 ulcer on neck, three weeks, with laryngitis and bronchitis. 1 for compound dislocation of ankle and removal of part of astrágalus. 1 for compound fracture of the leg. 1 for lacerated wounds on heels and fractured arm.
1 „	8	„	for lacerated wound of the foot.
3 „	9	„	1 for burn. 1 for burn. 1 for compound fractured leg.
4 „	10	„	1 for lacerated wound of arm, extensive. 1 for lacerated wound of hand. 1 for compound fractured metacarpal bones. 1 for extensive burn.
2 „	11	„	1 for compound fractured thumb. 1 for lacerated wound of the knee.
1 „	12	„	for lacerated wound of the leg and ligature of posterior tibial artery.
1 „	13	„	for severe burns.
1 „	14	„	for lacerated wound about the ankle.
1 „	15	„	for compound fractured fingers, followed by gangrene and amputation nine days after; metallic sutures used the day before the attack.
3 „	19	„	1 for lacerated wound of leg. 1 for crushed forearm, followed by gangrene; separation assisted by the knife on 13th day. 1 for diseased knee-joint; amputation on 8th day after.
1 „	21	„	for burn.
1 „	24	„	for deformity from cicatrix of burn; operation three days after admission.
1 „	24	„	inflamed bursa; laid open by incision 16 days after.
2 „	27	„	1 for compound fracture of the leg; but two days previous to the attack was exposed to draught of cold air. 1 for penetrating wound of the thigh.

In strictly analysing the whole of the 72 cases, we are able to refer no less than 17 cases to exposure and change of temperature either solely or associated with injury and disease.

We have been persuaded to insert the following table, showing the state of the wind during the day of the attack and the two preceding days. The first letter indicates the wind on the day of attack; and the other letters the days preceding it in relative order. Larrey asserts that tetanus was found to be prevalent during the N.N.W. winds. The diagram merely shows that there was a greater amount of tetanus during the westerly winds; but then we must recollect that there is a greater prevalence of these winds in this country. The asterisks denote the winds of those cases who were attacked with tetanus whilst in the hospital. It is placed here for the curious.

N.N.W.	1. N.N.W., E., N.W.*
N.	1. N., S.W., W. 2. N., S.W., E.* 3. N., N., S.W. 4. N., W., W. 5. N., N., N.*
N.N.E.	1. N.N.E, S.S.W., N.N.E.* 2. N.N.E., S.S.W., N.N.E.*
NE.	1. N.E., W., S. 2. N.E., N.E., S.W.* 3. N.E., N.E., N.E.*
E.N.E.	
E.	1. E., W., S.W.* 2. E., N., W. 3. E., N., N.W. 4. E., N.E., E. 5. E., E., N.E.* 6. E., E., E. 7. E., E., E. 8. E., E., E.S.E.* 9. E., S.E., E.* 10. E., S.E., E.
E.S.E.	1. E.S.E., S.E., S.E.
S.E.	1. S.E., N.E., N.E.* 2. S.E., N.E., S. 3. S.E., S., S.W. 4. S.E. and S., S.E., W.*
S.S.E.	
S.	1. S., N., E. 2, 3, 4. S., E., S. 5. S., S.W. var., S. 6. S., S.W., S.W.*
S.S.W.	1. S.S.W., S.S.W., S.S.W.
S.W.	1. S.W., E., E. 2. S.W., E., S.W.* 3. S.W. var., S., S. 4. S.W., S., S.W. 5. S.W., S.S.W., S.E. 6. S.W., S.S.W., S.W. 7. S.W., S.W., S.* 8. S.W. var., S.W., S.S.W.* 9. S.W., S.W., W.* 10. S.W., S.W. 11. S.W., S.W., S.W.* 12, 13. S.W., S.W., S.W. 14. S.W. var., W., N.W.* 15. S.W., W., N.W.* 16. S.W., N.W., N. 17. S.W., N.E., N.W.*
W.S.W.	1. W.S.W., S.W., S.W.*
W.	1. W., S., S.W.* 2. W., S., S.W.* 3. W., S.W.* 4, 5. W., S.W., W. 6, 7. W., S.W., W.* 8. W., S.W., N.E. 9. W., W.S.W., N.N.E. 10. W., N., S.W.* 11. W., N.E., N.* 12. W., N.E., N.W. 13. W., N., N. 14. W., E., N.W.
W.N.W.	1. W.N.W., W., W.
N.W.	1. N.W., W.S.W., S.W. 2. N.W., W.S.W., N.W. 3. N.W., W. 4. N.W., N.W., W. 5. N.W., N.E., S. 6. N.W., N.E., S.W.*

As we shall have to compare the Indian returns with the European, we have briefly extracted the following from Dr. Morehead's work on the temperature of the different months.

Daily temperature at Bombay.

Minimum at sunrise, rises rapidly till 9 a.m.; then rises slowly, and attains maximum at noon; declines slowly till 5 or sunset, takes a rapid stride down till about 7 p.m., and slowly declines to sunrise. Sometimes daily variation very great, as much as from 20° to 23°; is rare, and only occurs in cold months.

January is the coldest month.

December and *February* almost the same, as also February and March.

April and *May* are the hottest.

Six years' general average—1847 *to* 1852.

January	73·4
February	75·1
March	79·4
April	82.6
May	84·8
June	82·3
July	80·9
August	80·2
September	80·1
October	81·8
November	79·2
December	75·9

Coldest—December, January, February, and March.
Hottest—April, May, June, and July.
Temperate—August, September, October, and November.

We will now proceed to compare the various returns in the following order:—

I. The occurrence of tetanus in the several separate months and seasons of the year.

II. The probable influence of the seasons:

1. On recovery.
2. On mortality.
   - *a.* In each separate month.
   - *b.* In each quarter of the year.
   - *c.* In the different seasons of hot, cold, and temperate months.

A. *Occurrence of Tetanus in the several separate months.*

	Guy's.	Glasgow.	Published Cases, Traumatic only.	Bombay.	
				Dr. Morehead, 6 years, from 1848 to 1853.	Mr. Peat, 7 years, from 1845 to 1851.
January .	6	6	16	12	11
February .	2	6	12	17	19
March . .	4	6	10	25	17
April . .	6	6	12	21	17
May . .	5	5	16	23	19
June . .	12	3	8	15	16
July . .	6	5	11	13	12
August .	8	1	13	8	12
September	4	4	7	12	13
October .	7	7	22	17	16
November	9	2	19	18	19
December	3	2	19	23	24
Total .	72	52	165	204	195

Order of frequency of Tetanus in the several months.

Guy's.	Glasgow.	Bombay.		Published Cases.
		Dr. Morehead.	Mr. Peat.	
June 12	October 7	March 25	December 24	October 22
November 9	January 6	May 23	February 19	November 19
August 8	February 6	December 23	May 19	December 19
October 7	March 6	April 21	November 19	January 16
January 6	April 5	November 18	March 17	May 16
April 6	May 5	February 17	April 17	August 13
July 6	July 5	October 17	June 16	February 12
May 5	September 4	June 15	October 16	April 12
March 4	June 3	July 13	September 13	July 11
September 4	November 2	January 12	August 12	March 10
December 3	December 2	September 12	July 12	June 8
February 2	August 1	August 8	January 11	September 7

Comparison of the ratio of the several Collections.

A. HIGHEST RATIO IN THE SEVERAL MONTHS.

I. *Guy's*, highest ratio in	June	.	1 in 6,	or 16·66 per cent.
Glasgow, ratio	„	.	1 in $17\frac{1}{3}$,	or 5·78 „
Bombay (Dr. Morehead), ratio	„	.	1 in $12\frac{1}{15}$,	or 7·35 „
„ (Mr. Peat), ratio	„	.	1 in $12\frac{3}{16}$,	or 8·2 „
Published cases (traumatic only) ratio	„	.	1 in $20\frac{5}{8}$,	or 4·84 „
II. *Glasgow*, highest ratio	October	.	1 in $7\frac{3}{7}$,	or 13·46 „
Published Cases, also highest ratio	„	.	1 in $7\frac{1}{2}$,	or 13·33 „
Guy's, ratio	„	.	1 in $10\frac{2}{7}$,	or 9·86 „
Bombay (Dr. Morehead), ratio	„	.	1 in 12,	or 8·33 „
„ (Mr. Peat), ratio		.	1 in $12\frac{13}{15}$,	or 8·2 „
III. *Bombay* (Dr. Morehead), highest ratio	March	.	1 in $8\frac{4}{23}$,	or 12·25 „
„ (Mr. Peat), ratio	„	.	1 in $11\frac{8}{17}$,	or 8·71 „
Guy's, ratio	„	.	1 in 18,	or 5·55 „
Glasgow, ratio	„	.	1 in $8\frac{2}{3}$,	or 11·53 „
Published cases, ratio	„	.	1 in $16\frac{1}{2}$,	or 6·06 „
IV. *Bombay* (Mr. Peat), highest ratio	December	.	1 in $8\frac{1}{8}$,	or 17·43 „
Bombay (Dr. Morehead), ratio	„	.	1 in $8\frac{20}{23}$,	or 11·27 „
Guy's, ratio	„	.	1 in 26,	or 4.16 „
Glasgow, ratio	„	.	1 in 26,	or 3·84 „
Published cases, ratio	„	.	1 in $8\frac{13}{15}$,	or 11·51 „

B. LOWEST RATIO IN THE SEVERAL MONTHS.

I. *Guy's* lowest ratio	February	.	1 in 36,	or 2·77 „
Glasgow, ratio	„	.	1 in $8\frac{2}{3}$,	or 11·53 „
Bombay (Dr. Morehead), ratio	„	.	1 in 12,	or 8·33 „
„ (Mr. Peat), ratio	„	.	1 in $10\frac{5}{19}$,	or 9·74 „
Published cases, ratio	„	.	1 in $13\frac{3}{4}$,	or 7·27 „
II. *Glasgow*, lowest ratio	August	.	1 in 52,	or 1·92 „
Bombay (Mr. Peat), ratio	„	.	1 in $16\frac{1}{4}$,	or 6·15 „
Guy's ratio	„	.	1 in 9,	or 11·11 „
Bombay (Dr. Morehead), ratio	„	.	1 in $25\frac{1}{2}$,	or 3·92 „
Published cases, ratio	„	.	1 in $12\frac{9}{13}$,	or 8·24 „
III. *Bombay* (Mr. Peat), lowest ratio	January	.	1 in $17\frac{8}{11}$,	or 5·64 „
Bombay (Dr. Morehead), ratio	„	.	1 in 17,	or 5·88 „
Guy's, ratio	„	.	1 in 12,	or 8·33 „
Glasgow, ratio	„	.	1 in $8\frac{2}{3}$,	or 11·53 „
Published cases	„	.	1 in $10\frac{5}{16}$,	or 9·69 „
IV. *Published Cases*, lowest ratio	September	.	1 in $23\frac{1}{4}$,	or 4·24 „
Guy's, ratio	„	.	1 in 18,	or 5·55 „
Glasgow, ratio	„	.	1 in $12\frac{1}{3}$,	or 7·69 „
Bombay (Dr. Morehead), ratio	„	.	1 in 17,	or 8·33 „
„ (Mr. Peat), ratio	„	.	1 in 15,	or 6·66 „

The above sufficiently indicate, that no great reliance can be placed on isolated returns; as each collector would argue

from his cases, that tetanus was more prevalent in certain months. Thus, the Guy's statistician would select June as the most frequent month, and February the least; but Glasgow would select October on the one hand, and August on the other. However, the foregoing Tables will explain these points.

B. *Cases occurring in the several separate seasons of the year.*

The seasons are generally divided into the Cold, Temperate, and Warm.

1. Four Cold Months—November, December, January, and February.

Guy's	20 cases	27·77 per cent.
Glasgow	16 „	30·76 „
Published cases	60 „	40·— „
Bombay, Mr. Peat	73 „	37·43 „
„ Dr. Morehead	70 „	34·31 „

2. Four Temperate Months—March, April, September, October.

Guy's	21 cases	29·16 per cent.
Glasgow	22 „	42·3 „
Published cases	51 „	30·99 „
Bombay, Mr. Peat	63 „	32·3 „
„ Dr. Morehead	59 „	28·92 „

3. Four Warm Months—May, June, July, August.

Guy's	31 cases	43·05 per cent.
Glasgow	14 „	26·92 „
Published cases	48 „	29·09 „
Bombay, Mr. Peat	59 „	30·25 „
„ Dr. Morehead	75 „	36·76 „

Thus the Guy's Hospital and Dr. Morehead's Bombay returns give the highest ratio in the warm months; the Glasgow in the temperate months; and the published cases, and Mr. Peat's Bombay returns, in the cold months. This discrepancy at least will lead us not to place too much confidence in special returns. Perhaps the Bombay returns ought hardly to be placed in comparison with the others, inasmuch as the cold months embrace December, January, February, and March. Hence we have deemed it advisable to take their own proper returns, which are as follows:

1. Four Cold Months—December, January, February, and March.
   Bombay, Mr. Peat . . 71 cases 36·41 per cent.
   „ Dr. Morehead . 77 „ 37·74 „
2. Four Temperate Months—April, May, June, and July.
   Bombay, Mr. Peat . . 64 cases 32·82 per cent.
   „ Dr. Morehead . 72 „ 35·29 „
3. Four Warm Months—August, September, October, November.
   Bombay, Mr. Peat . . 60 cases 30·76 per cent.
   „ Dr. Morehead . 55 „ 26·96 „

By this we see that both Mr. Peat's and Dr. Morehead's Bombay returns give the larger number in the cold months, although, in the former compared tables, Dr. Morehead's returns gave the largest ratio in the warmer months.

Taking the half-yearly returns of Bombay Hospital:

December to May . . 121 cases, 59·31 per cent., Dr. Morehead.
„ „ . . 107 „ 54·87 „ Mr. Peat.
June to November . . 83 „ 40·68 „ Dr. Morehead.
„ „ . . 88 „ 45·12 „ Mr. Peat.

In these returns we have a decided predominance of cases occurring in the cold and the one half of the temperate months, and is contradictory to what has been generally advanced.

II.—Influence of the Season.

A. *On the Recovery from Tetanus.*

1. *In the separate months:*

Guy's.		Glasgow.		Published Cases.		Bombay (Dr. Morehead).	
August . .	3	January . .	2	May . . .	10	March . . .	11
June . . .	2	February . .	1	August . . .	10	May . . .	9
March . . .	1	April . . .	1	December . .	10	December . .	9
April . . .	1	May . . .	1	October . .	9	February . .	8
May . . .	1	June . . .	1	February . .	8	July . . .	8
September . .	1	October . .	1	April . . .	8	October . .	8
November . .	1		—	November . .	8	November . .	8
	—		7	January . .	6	April . . .	7
	10			March . . .	6	January . .	3
				July . . .	6	June . . .	3
				September . .	5	August . . .	2
				June . . .	4	September . .	1
					90		77

Guy's highest ratio of recovery in August, being 30· per cent of recoveries.
Glasgow, highest ratio of recovery in January, being 28·56 per cent. of recoveries.
Published cases, highest ratio of recovery in May, August, and December, being 11·11 per cent. individually.
Bombay, highest ratio of recovery in March, being 14·28 per cent.

2. In the Several Seasons.

1. *The Four Cold Months.*

Guy's	1	case in 10	recoveries, being	10·	per cent.
Glasgow	3	„ 7	„	42·85	„
Published cases	32	„ 90	„	35·55	„
Bombay	28	„ 77	„	36·36	„

2. *The Four Temperate Months.*

Guy's	3	cases in 10	recoveries, being	30·	per cent.
Glasgow	2	„ 6	„	33·33	„
Published cases	28	„ 90	„	31·11	„
Bombay	27	„ 77	„	35·06	„

3. *The Four Warm Months.*

Guy's	6	cases in 10	recoveries, being	60·	per cent.
Glasgow	2	„ 6	„	33·33	„
Published cases	30	„ 90	„	33·33	„
Bombay	22	„ 77	„	28·57	„

Thus Guy's has most recoveries in the warm months and least in the cold. Glasgow the majority of recoveries in the cold season, and in each of the other seasons the least. Published cases nearly equal, 2 more in the cold than in the warm season, and the latter 2 more than the temperate. Bombay also very similar; but requires the following consideration:

1 in cold months	31	recoveries in	77, being	40·25	per cent.
2 in temperate months	27	„	77 „	35·06	„
3 in warm months	19	„	77 „	24·67	„

So that Bombay has a very large proportion of the recoveries in the cold season over that of the warm; and taking the returns according to the half year we find—

From December to May	47 recoveries.	61·03 per cent.
From June to November	30 „	38·96 „

b. Influence of the season on mortality.

These are, for the most part, mere negative facts—

1. In *the separate weeks* of the year.

The registration of deaths from tetanus, according to the several weeks, have only been performed by the Registrar-General.

We have thought fit to append his return of 12 years in this place, recollecting that it includes *all* cases of tetanus, there being upwards of 60 cases under 5 years of age out of 222, the total number, nearly one fourth.

Deaths from Tetanus registered in the several weeks of each of the following years in London.

Week	Total	1845	1846	1847	1848	1849	1850	1851	1852	1853	1854	1855	1856	Week
1st	2	...	...	...	...	...	1	...	...	...	...	1	...	1st
2d	2	...	1	...	...	1	...	...	...	...	...	...	...	2d
3d	4	...	1	1	...	...	...	1	1	...	...	...	...	3d
4th	2	...	...	...	...	...	...	...	...	...	...	2	...	4th
5th	3	...	...	...	...	1	1	...	...	...	1	...	...	5th
6th	3	...	...	...	...	...	...	2	...	...	1	...	...	6th
7th	4	...	...	...	...	1	...	1	...	...	...	1	1	7th
8th	2	...	...	...	...	...	...	1	1	...	...	...	...	8th
9th	3	...	...	...	...	...	1	1	...	...	...	1	...	9th
10th	4	...	...	...	...	...	...	...	...	...	2	2	...	10th
11th	5	...	3	...	...	1	...	...	...	...	1	...	..	11th
12th	6	2	...	1	...	...	...	...	1	1	...	...	1	12th
13th	12	...	2	...	1	1	1	1	3	1	...	2	...	13th
14th	10	2	1	1	1	...	2	1	...	1	...	...	1	14th
15th	5	...	...	...	...	...	...	1	1	...	...	3	...	15th
16th	4	2	...	...	...	...	...	1	...	...	1	...	...	16th
17th	6	...	...	...	2	...	...	1	3	...	...	...	...	17th
18th	3	1	1	...	...	...	...	...	...	...	1	...	...	18th
19th	6	...	...	...	...	1	2	1	...	...	...	...	2	19th
20th	5	...	1	...	...	...	...	...	3	...	...	1	...	20th
21st	2	...	...	.	...	1	1	...	...	...	...	...	...	21st
22d	5	...	...	...	...	...	1	2	1	1	...	...	...	22d
23d	4	1	1	...	...	...	...	1	1	...	...	...	...	23d
24th	6	1	...	...	1	2	...	...	...	...	2	...	...	24th
25th	9	...	1	1	...	3	...	1	...	...	1	...	2	25th
26th	6	...	1	...	...	...	...	...	3	...	...	1	1	26th
27th	4	...	...	...	1	...	...	...	...	1	1	...	1	27th
28th	2	...	...	...	...	1	...	...	...	...	1	...	...	28th
29th	3	...	...	...	...	1	...	1	...	...	...	1	...	29th
30th	7	1	1	...	2	...	...	...	1	1	...	...	1	30th
31st	3	1	...	1	...	...	...	...	...	...	...	1	...	31st
32d	2	...	...	...	...	...	...	...	1	...	1	...	...	32d
33d	4	1	...	2	...	...	1	...	...	...	...	...	...	33d
34th	0	...	...	...	...	...	...	...	...	...	...	...	...	34th
35th	4	1	...	1	...	...	2	...	...	...	...	...	...	35th
36th	3	...	...	...	...	1	...	...	...	...	1	...	1	36th
37th	2	...	...	...	...	1	1	...	...	...	...	...	...	37th
38th	3	...	...	...	...	1	...	...	1	...	...	...	1	38th
39th	4	...	1	...	...	2	...	...	...	...	1	...	...	39th
40th	6	1	...	1	...	...	1	...	1	...	...	2	...	40th
41st	5	1	...	...	1	...	...	...	...	...	...	2	1	41st
42d	7	2	...	...	2	...	...	...	...	...	...	2	1	42d
43d	4	...	1	...	...	2	...	...	...	...	...	...	1	43d
44th	4	...	1	...	...	...	1	...	...	...	1	1	...	44th
45th	6	...	1	...	1	1	...	1	...	1	1	...	...	45th
46th	4	...	...	1	...	...	2	...	...	...	1	...	...	46th
47th	4	...	...	2	...	...	...	...	1	...	...	...	1	47th
48th	2	...	1	...	...	...	...	...	1	...	...	...	...	48th
49th	2	...	...	...	...	1	...	...	...	...	...	1	...	49th
50th	5	2	1	...	...	1	...	1	...	...	...	...	...	50th
51st	2	...	...	...	...	...	...	...	1	...	...	...	1	51st
52d	7	...	...	1	...	...	...	2	...	1	1	...	2	52d
	222	19	20	13	12	24	18	21	25	8	19	24	19	

2. *In the several months—*

Guy's.		Glasgow.		Published Cases.		London Registrar-General 12 years 1845 to 1856.		Bombay.			
								Dr. Leith 5 years 1848 to 1852.		Dr. Morehead 6 years 1848 to 1853.	
June	10	October	6	October	13	March	27	March	163	March	14
Nov.	8	March	6	Nov.	11	April	26	Dec.	162	April	14
October	7	February	5	January	10	June	25	June	158	May	14
January	6	July	5	Dec.	9	October	22	April	156	Dec.	14
July	6	January	4	May	6	May	21	Nov.	152	June	12
April	5	April	4	July	5	Nov.	20	May	149	Sept.	11
August	5	May	4	February	4	July	16	July	136	Nov.	10
May	4	Sept.	4	March	4	Dec.	16	Oct.	130	January	9
March	3	June	2	April	4	Feb.	14	Feb.	129	February	9
Sept.	3	Nov.	2	June	4	August	13	Jan.	128	October	9
Dec.	3	Dec.	2	August	3	Sept.	12	August	127	August	6
February	2	August	1	Sept.	2	January	10	Sept.	126	July	5
	62		45		75		222		1716		127

We have thought necessary to insert the following table in full, as being interesting. It is from the pen of Dr. Leith, Registrar of Deaths at Bombay, taken from 1848 to 1852. 1716 deaths from tetanus, or 2·5 per cent. of total deaths.

	1848.	1849.	1850.	1851.	1852.	Total.
January . . .	34	24	31	18	21	128
February . . .	27	17	25	28	32	129
March . . .	29	28	45	26	35	163
April	18	24	52	26	36	156
May	24	31	44	28	22	149
June	25	28	50	21	34	158
July	27	24	37	27	21	136
August . . .	17	27	30	29	24	127
September . . .	16	24	27	31	28	126
October . . .	17	24	35	30	24	130
November . . .	27	27	34	29	35	152
December . . .	22	35	37	39	29	162
Total . . .	283	313	447	332	341	1716

1st Return, showing highest ratio of each collection, and the average proportion to each other in the several months.

(*a*) Guy's highest ratio . .	June	16·12	per cent.
Glasgow ratio . .	„	4·44	„
Published Cases ratio . .	„	5·33	„

	London Registrar-General ratio	„	11·26 per cent.
	Bombay Registrar-General ratio	„	9·2 „
	Bombay Hospital ratio	„	9·45 „
(*b*)	Glasgow highest ratio (equally in March)	October	13·33 „
	Published Cases highest ratio also	„	17·33 „
	Guy's ratio	„	11·29 „
	London Registrar-General ratio	„	9·9 „
	Bombay Registrar-General ratio	„	7·57 „
	Bombay Hospital	„	7·08 „
(*c*)	London Registrar-General highest ratio	March	12·16 „
	Glasgow (also in October) highest ratio	„	9·9 „
	Bombay Registrar-General ratio	„	13·33 „
	Bombay Hospital (equally so in April, May, December) ratio	„	11·02 „
	Guy's the only exception	„	4·16 „

2d Return, showing lowest ratio of deaths in the several collections.

(*a.*)	Guy's lowest ratio	February	3·22 per cent.
	Glasgow, ratio	„	11·11 „
	Published cases, ratio	„	5·33 „
	London Registrar-General, ratio	„	6·3 „
	Bombay Registrar, ratio	„	7·51 „
	Bombay Hospital, ratio	„	7·08 „
(*b.*)	Glasgow's lowest ratio	August	2·22 „
	Guy's ratio	„	8·06 „
	Published cases, ratio	„	4· „
	London Registrar-General, ratio	„	5·85 „
	Bombay Registrar, ratio	„	7·4 „
	Bombay Hospital, ratio	„	4·72 „
(*c.*)	Published cases, lowest ratio	September	2·66 „
	Bombay Registrar, also lowest ratio	„	7·34 „
	Guy's ratio	„	4·83 „
	London Registrar-General, ratio	„	5·4 „
	Bombay Hospital, ratio	„	8·65 „
	Glasgow, ratio	„	8·88 „
(*d.*)	London Registrar-General, lowest ratio,	January	4·5 „
	Guy's ratio	„	9·67 „
	Glasgow, ratio	„	8·88 „
	Published cases, ratio	„	13·33 „
	Bombay Registrar, ratio	„	7·45 „
	Bombay Hospital, ratio	„	7·08 „
(*e.*)	Bombay Hospital, lowest ratio	July	3·92 „
	Guy's ratio	„	9·67 „
	Glasgow, ratio	„	11·11 „
	Published cases, ratio	„	6·66 „
	London Registrar-General, ratio	„	7·2 „
	Bombay Registrar, ratio	„	7·91 „

3d, In the several quarters of the year.—We prefer making the comparison according to the season, and not in reference to the quarters. However, as the registrar-general and others have made the returns under this class, we have merely appended the returns without comment.

Mr. Peat, in his report of the cases in the Bombay hospital, for seven years from 1845 to 1851, classes the cases according to the quarters of the year.

One hundred and ninety-five cases were admitted, exclusive of seventy or eighty persons attacked whilst in the hospital, and not recorded under the head of tetanus.

First quarter . .	47 admitted	30 died	63·8 per cent.
Second quarter . .	52 „	38 „	73· „
Third quarter (monsoon prevalent)	37 „	30 „	81· „
Fourth quarter (great alteration of temperature; cold, head wind set in at night) . .	59 „	47 „	79· „
Total . .	195 „	145 „	74·3 „

120 were traumatic, 87 died, being 72·7 per cent.
75 were idiopathic, 57 died, being 76· per cent.

Mr. Peat infers that idiopathic tetanus is most common in October, November, and December. Traumatic in April, May, and June.

The returns of the Registrar-General of England, according to the several quarters, are arranged in the following table, but has reference to the deaths in London only.

LONDON.

—	First quarter, ending March.	Second quarter, ending June.	Third quarter, ending September.	Fourth quarter, ending December.
	Cases in Total deaths.	Cases in Total deaths.	Cases in Total deaths.	Cases in Total deaths.
1840	9 in 11,981	4 in 10,952	5 in 11,212	8 in 13,019
1841	8 in 13,930	6 in 10,595	3 in 10,567	3 in 11,104
1842	9 in 12,626	3 in 10,427	2 in 11,225	1 in 11,954
1843	3 in 12,504	2 in 11,621	5 in 11,271	7 in 14,095
1844	8 in 13,471	7 in 11,471	9 in 11,825	4 in 13,819
1845	3 in 14,528	7 in 11,267	4 in 10,842	6 in 11,838
1846	7 in 12,376	5 in 11,271	2 in 12,409	5 in 13,221
1847	2 in 15,289	3 in 12,361	4 in 13,187	5 in 19,605
1848	1 in 16,455	5 in 12,945	3 in 13,503	4 in 14,725
1849	5 in 15,438	7 in 13,008	7 in 27,109	5 in 12,877
1850	4 in 13,219	6 in 11,238	4 in 11,578	4 in 12,554
1851	7 in 15,410	9 in 13,093	1 in 12,887	4 in 13,964
1852	6 in 14,481	11 in 13,173	3 in 13,111	4 in 13,448
1853	2 in 15,864	2 in 15,030	3 in 12,918	3 in 17,390
1854	5 in 16,534	5 in 15,055	4 in 24,870	4 in 17,238
1855	9 in 19,627	5 in 14,997	2 in 13,042	8 in 13,840
1856	2 in 14,533	6 in 14,069	4 in 14,066	7 in 14,118
1857	3 in 16,093	...	...	...
18 years.	93 in 259,359	93 in 212,573	65 in 236,622	82 in 238,809

4. IN THE SEVERAL SEASONS.

A. FOUR COLD MONTHS—November, December, January, and February:

Guy's	19 in	62, or 30·64	per cent.
Glasgow	13 in	45, or 28·88	,,
Published cases	34 in	75, or 45·33	,,
London Registrar-General	60 in	221, or 27·14	,,
Bombay Registrar (Mr. Leith)	571 in	1716, or 33·27	,,
Bombay Hospital (Dr. Morehead)	42 in	127, or 33·07	,,

B. FOUR HOT MONTHS—May, June, July, August:

Guy's	25 in	62, or 40·32	,,
Glasgow	12 in	45, or 26·66	,,
Published cases	18 in	75, or 24·	,,
London Registrar-General	75 in	221, or 33·93	,,
Bombay Registrar	570 in	1716, or 33·21	,,
Bombay Hospital	37 in	172, or 29·13	,,

C. FOUR TEMPERATE MONTHS—March, April, September, and October:

Guy's	18 in	62, or 29·03	per cent.
Glasgow	20 in	45, or 44·44	,,
Published cases	23 in	75, or 30·66	,,
London Registrar-General	86 in	221, or 38·91	,,
Bombay Registrar	575 in	1716, or 33·5	,,
Bombay Hospital	48 in	127, or 37·8	,,

BOMBAY.

A. *Coldest Months*—December, January, February, and March:

Hospital Return	46 in 127, or 36·22	per cent.
Registrar	582 in 1716, or 33·91	„

B. *Hottest Months*—April, May, June, July:

Hospital Return	45 in 127, or 35·43	„
Registrar	599 in 1716, or 34·9	„

C. *Temperate Months*—August, September, October, November:

Hospital Return	36 in 127, or 28·34	„
Registrar	535 in 1716, or 31·17	„

	Bombay Hospital, 6 years.	Bombay Registrar.	Bombay Hospital, 9 years, 1845 to 1853.
Half-year, December to May	74	887	164
„ June to November	53	829	125
	127	1716	289
		2·5 per cent. of total deaths.	Of these 186 died, or 64·3 per cent.

Thus Guy's has greatest mortality in the hot months, being 40 per cent.; Glasgow, in the temperate, 44 per cent.; Published Cases, in the cold, 45 per cent.; and Bombay nearly equal ratio in each season.

Registrar-General's return of deaths from Tetanus compared with deaths from all causes during the several years.

I. LONDON.

1840	46,281	total deaths.	26	deaths from tetanus.
1841	45,284	„	20	„
1842	45,272	„	15	„
1843	48,574	„	17	„
1844	50,423	„	28	„
1845	48,332	„	20	„
1846	49,089	„	19	„
1847	60,442	„	14	„
1848	57,628	„	13	„
1849	68,432	„	24	„
1850	48,579	„	18	„
1851	55,354	„	21	„
1852	54,213	„	24	„
1853	61,202	„	10	„
1854	73,697	„	18	„
1855	61,506	„	24	„
1856	56,786	„	19	„
17 yrs.	931,094	„	330	„ ·0035 per cent.

II. England.

1847	423,304	total deaths.	165	deaths of tetanus.	
1848	399,833	„	131	„	
1849	440,839	„	133	„	
1850	368,995	„	108	„	
1851	395,396	„	118	„	
1852	407,138	„	145	„	
1853	421,807	„	116	„	
1854	438,239	„	180	„	
8 yrs.	3,295,551	„	1096	„	·0033 per cent.

The following interesting records will not be out of place in a paper embracing a comprehensive view of tetanus; the facts bear strongly in favour of atmospheric influence as the real point of causation:

Occurrence of Tetanus after naval and military engagements.

A. French.—Baron Larrey gives by far the most interesting account of this disease after the several battles in the different campaigns.

I. In the Campaign in Egypt.—Tetanus very acute, and affected chiefly the muscles of larynx and deglutition.

1. *At Cairo, after the Battle of Sedment.*

3 fatal cases after slight gun-shot wounds, setting in on the 9th day.
1 in the soft part of the thigh, fatal in 3 days.
1 in the calf of the leg, „ 4 days.
1 in concha of right ear, „ 7 days.

1 recovery. An officer—gun-shot wound of left foot; wound enlarged and splinters removed. Symptoms supervened on 13th day, at first severe, afterwards slow and chronic, when wound again enlarged and pieces of bones removed. On 15th day of attack became very acute; patient emaciated and death expected. Amputation as a last resource, and unexpected recovery.

2. *After the Battle of the Pyramids.*

5 attacked, and all fatal on the 3d, 4th, and 5th days. Cause attributed to the moisture and coldness of the night air.

3. *Revolt of Cairo.*

Wounded treated in the hospital at Cairo. The hospital walls abut and washed by the waters of the Nile, during three months of the year. Tetanus attacked 7, and all perished.

4. *After the Battle d'el A'rich.*

Wounded placed under a tent on moist ground, and exposed to continual rains. 8 attacked, and all died in from 5 to 7 days.

5. *Taking of Jaffa.*

Several lost by tetanus, generally in 2 or 3 days; the season of the year rainy, and the hospital close to the sea.

On descending the Nile to reach Alexandria, General Daumartin was attacked by Arabs and received 4 slight gun-shot wounds, one in right leg, another in left thigh, a third grazed the chest, and the fourth ball entered the right arm; he received no medical aid until 5th day, when the wounds were dressed, and a few days after had the ball extracted near the elbow. On 9th day symptoms of tetanus supervened, the suppuration in the wounds then being considerably diminished; became rapidly acute and fatal 6 days after invasion and 15 after receiving of wounds.

6. *Battle of Aboukir.*

Wounded transmitted to the hospital at Aboukir. 10 attacked, all of whom had been previously exposed to cold, fresh nights, the wounds being on the head, trunk, and upper part of thigh; disease rapid and all fatal at the usual periods.

Larrey mentions several other isolated cases of deaths and recovery from tetanus while in Egypt; but they do not find a place in the above returns.

II. In the Campaign in Austria.

1. *In the Hospital at Renevecale.*

Several cases, and generally attacked the young soldiers wounded about the ginglymoid joints and the deep-seated soft parts, with loss of substance. The symptoms were very analogous to those in Egypt; but not so intense. It was most common after exposure to cold, moist air, chiefly in spring, and with N.N.W. winds. Rare when temperature equal.

2. *At the Battle of Eylau.*

Not one of the wounded Guards had tetanus, and only a very small number of the line. The most marked were—

1. The son of General Darmagnac, and supervened after amputation of the arm, and was speedily fatal. On examination, median nerve found included with the artery in the ligature; its extremity was red and swollen.
2. Soldier wounded in right thigh by ball. Acute tetanus; plunged in cold bath twice; resisted forcibly the third time; terrible convulsions, and death in few hours after. Heart empty and contracted. Rupture of the rectus abdominis muscle. Crural and sciatic nerves torn by ball.

A very small number of amputations were attacked with tetanus.

Larrey here introduces remarks on the causes of the tetanus in this campaign.

1st. Suppression of the discharge.

2d. Sudden change from heat to cold, especially the cold, moist air of spring nights; great variation at this season; during the day 19, 20, 21, and 23 degrees above zero, and during the night the mercury descended to 13, 12, 10, 9, and 8.

III. In the Campaign of Russia and Saxony.

Tetanus attacked mostly those with wounds and fracture near joints, those with wounds in the thick of the limbs with loss of substance, and also a great number of those where the thigh had been amputated. With the exception of 1, all died. 22,000 wounded. 972 amputations; 241 fatal. Number of cases of tetanus not stated.

After the Battle of Moscow, in the midst of great heats, very few of the French troops were affected with tetanus, whereas those who were wounded in *the Battle of Dresden* where the weather was cold and wet, just after a very hot season, were decimated by that complaint, which did not spare even those who underwent immediate amputation.

B. English Campaigns, as recorded by Sir James M'Gregor. No satisfactory returns published.

1st Campaign, December, 1811, to April, 1812—Opened in north of Portugal—very inclement weather, very little shelter, severe and harassing duties. Then employed at the siege of Ciudad Rodrigo. Snow fell occasionally, and in December, January, and February ground usually covered with hoar-frost.

The wounded were very considerable, and were removed to Coimbre, 40 leagues from Ciudad Rodrigo; a great many were frost-bitten. Tetanus was not unfrequent.

In February occurred the siege of Badajoz. It rained heavily, the duties were severe, and much intemperance; there were 5000 wounded, and tetanus stated to be not unfrequent.

2d Campaign, or period from June, 1812, when the English took the field, to November, 1812, when they retreated from Madrid to Burgos.

During this period the army was most actively employed, and traversed the greater part of Spain. It was exposed to the burning sun during the day, and during the night generally sleeping in the open air. From June till September the heat was considerable, in August being seldom under 90° F.; rain commenced in September and continued very heavy in October and during the greater part of November, when severe cold weather set in.

During this period, after the Battle of Salamanca, in August, tetanus was prevalent; and some cases of it occurred at the siege of Burgos.

1*st Interregnum.*—From November, 1812, to May, 1813, army employed in refitting and recruiting in cantonments.

3d Campaign, from May, 1813, to the winter of 1813, including the battles of Vittoria, Pampeluna, and Storming of St. Sebastian, a campaign of a series of actions and many wounded. Tetanus was more prevalent than it had hitherto been in the Peninsular.

2*d Interregnum.*—Winter quarter, 1813 to 1814, including November, December, and January. Severe weather. Rheumatism prevailed.

4th Campaign, February, 1814, to May, 1814. Advance into France across the Nivelle, the Nieve, and about end of February the river Adour; then to battle of Orthes, and afterwards capture of Toulouse. Battle of Toulouse; 5 cases; all fatal. In January a good many wounded. Climate and season favorable, and army suffered very little.

December, 1811, to June, 1814.—20,836 wounded admitted into the regimental hospitals. No precise number recorded—of these only 506 died of their wounds. Average number of cases of tetanus amongst the wounded was about 1 in 79.

Sir James M'Gregor remarks that tetanus was always very prevalent after great battles, and was so frequent in the Peninsula. He mentions a remarkable case of slight injury to the finger; tetanus supervened and was unusually severe. During the first part of the day of attack the patient was drenched with rain, the thermometer being 52°; and after ascending one of the highest mountains in Gallicia, the snow was knee deep, and the thermometer below 10°. The patient was exposed to this inclement weather from 6 a.m. to 10 p.m., when he arrived at quarters, half starved to death, but perfectly free from every symptom.

Returns unsatisfactory:

		Admission.	Deaths.	Deaths from Tetanus.
General Hospital.	From Dec. 21st, 1811, to Dec. 20th, 1812	95,075	6931	
	„ 1112 „ 1813	46,715	5267	3
	„ 1813 „ 1814	22,013	4855	6
	Total,	163,803	14,672	9
Regimental Hospital . . .		176,067	3,841	—
	Total,	339,870	18,513	

In 1812, in all hospitals, general and regimental, admissions 176,180 deaths 7193
1813 „ „ admissions 123,019 deaths 6866
23 deaths from tetanus, 1 in 5,348
1814 „ „ admissions 53,073 „ 2909
24 deaths 1 in 2311

Dr. O. Beirne witnessed 200 cases in the Peninsula, not one of which recovered. It was generally considered to attack in the proportion of 1 in 200 wounded.

Sir George Ballinghall observes that, "in our *West India* settlements, it is a common occurrence both in its idiopathic and symptomatic forms; but my own experience in the *East Indies* does not lead me to consider it so common an occurrence in that climate as some authors would induce us to believe."

"It appears, however, that the frequency and severity of tetanus differs greatly even in similar latitudes and localities, from circumstances not always explained. I have frequently expressed my surprise and satisfaction at the results of the wounded which we had occasion to witness at the *taking of Java in* 1811. Out of 150 Europeans wounded at the attack of Fort Cornelius, near Batavia, only one tetanic case occurred; while in a small detachment which proceeded to Macassar, out of 8 or 10 wounded, 2 died of tetanus. Mr. Schaw, in an essay published in 1817, states that he had occasion to witness a large proportion of tetanic cases amongst the wounded Europeans and Sepoys employed in a successful attack upon Lambas, a piratical Malay town in the island of Borneo."

He also adverts to the diminished number of tetanic cases which have occurred amongst the wounded, since the practice of immediate amputation became generally established throughout the army and navy.

Dr. Hennen remarks, "it is a fact not a little curious, that patients under similar circumstances in every respect, of age, diet, nature, and period of infliction of wounds, as well as accommodation for their cure, shall become liable to it in one hospital or district of a town and be free from it in another."

"In almost all the instances that I have seen, the patients have been exposed to a stream of air directly blowing upon them; this has been sometimes cold, and at other times of a high temperature."

Dr. R. Huck, physician to the army in the last century, states that, of thirteen wounded men whom he had seen afflicted with locked-jaw, nine received their wounds at the attack of the French lines at Ticonderoga, in the year 1758, and remained exposed to the cold air, the night after the action, in open boats upon Lake George.

After Naval Engagements.

Sir J. Blane's action of 1782, called Rodney's action, took place off Guadaloupe, on April 12th, light winds at the time—810 wounded of whom 60 died on board in the month of April, 5 in the month of May, and 2 in the month of June. Of the 810 wounded, 20 were attacked with tetanus, being 1 in 40—17 died, and 3 recovered. An officer, wounded in the same action was seized with tetanus on his passage to England, and died.

Sir J. Blane remarks "that tetanus affected some ships, remarkably more than others, particularly the Barfleur and Bedford, though their wounds had nothing peculiar, nor were in greater proportion than in the rest of the fleet. Four died of tetanus in each of the above ships.

"This disease took a run in some particular ships last year, also, after the battle of the Chesapeake, and I have known it prevail in some particular hospitals more than others."

In the action of Copenhagen, in 1801, as large a proportion of tetanus occurred in the fleet as after any land battle whatever.

Dr. Lind, who was physician to the fleet about the middle of the last century, has recorded that, after amputations, five cases out of six generally proved fatal from an attack of lock-jaw.

M. François, of Auxerre, observes that, on board the Amazon Frigate, before Charlestown, during the American war, after some stormy and very wet weather, which had succeeded a continuance of dry, most of those wounded by fire-arms were attacked with tetanus on the fourteenth day.

Dr. Dickson, in the 'Med.-Chir. Trans.,' vol. vii, p. 44, respecting the expedition against New Orleans, January, 1815, says, "The examples that came within my knowledge were six or seven soldiers under the care of navy surgeons, and they occurred a few days after the attack of the 8th of January, 1815, and, consequently, in an inflamed and painful state of the wounds; but when the great number that suffered on that occasion, the distance which they were afterwards conveyed (chiefly in open boats), and their consequent exposure to the cold night air, and to the heavy rain which fell on the after-

noon of the 10th, are taken into consideration, it will rather be a matter of surprise, that so few instances followed, than that those which did occur proved so severe and so rapidly fatal.

"In my journal for August, 1807, Mr. Hardy, surgeon of the Jason, states that though the wounds and accidents had been numerous in the West Indies, no cases of tetanus occurred."

"During the occurrence of Larrey's cases in Egypt, I had above 100 English and French wounded (many of them very badly), in the battle of 13th March, 1801, without any instance of tetanus supervening."

"In the West Indies, during upwards of seven years' service, I do not recollect having heard of half a dozen instances of tetanus."

During the war in America there were

3 Fatal cases among the wounded of the "Hermes" after the attack of Fort Mobile, September 15th, 1814, 1, grape-shot wound of thigh.
1, injury to spine.
1, splinter wounding breast and knee.
1 Fatal case in the "Endymion" in the same action. Died at the hospital, Halifax.

Dr. M'Arthur, in the naval hospital, Halifax, for six years of most active period of late war, 1803 to 1809, only two cases out of the numerous cases of gun-shot wounds, and of the great number of operations.

From 1809 to 1812, same immunity; out of twenty-three amputations, one tetanus.

Mr. Sheppard resided in that climate for eight years, and never saw a case of tetanus in the West Indies.

The following observation is here inserted as corroborating some of the foregoing statements:

Hurtrel d'Arboval relates that 24 horses were castrated on the same day at Bec, in the Department de l'Eure. They were afterwards led four times in the day through a pond of water supplied from a very cold spring. Sixteen of them died from tetanus, between the tenth and fifteenth day after the operation.

Section VI.—Form of Disease, including the supposed Exciting Cause.

A. Idiopathic.—No external lesion visible.

Guy's.—3 cases, males; 2 recovered, 1 chronic and 1 subacute; 1 died, acute.
Proportion to total cases 1 in 24, or 4·16 per cent.

Glasgow.—2 cases in 52; 1 recovery, a male; 1 fatal, a female.
Proportion, 1 in 26, or 3·84 per cent.

Bombay.—75 cases in 195, 1 in $2\frac{3}{5}$, or 38·46 per cent.

B. Idiopathic and Traumatic, mixed.

Direct exposure, and having a wound at the time, generally ranked under the latter term, but would be more correct in being classified with the idiopathic. However, they are here placed alone.

Guy's.—9 cases, all males; 5 recovered, 1 trismus, 1 chronic, 1 subacute, and 2 acute; 4 fatal, 4 acute.
Proportion, 1 in 8, or 12·5 per cent.

C. Traumatic.

Guy's.—60 cases in 72. Proportion, 1 in $1\frac{1}{5}$, or 83·33 per cent.
12 females, all fatal; 10 acute and 2 subacute.
48 males: 3 recovered, 1 chronic, 1 subacute, 1 acute; 45 fatal, 2 trismus, 1 chronic, 3 subacute, and 39 acute.

Glasgow.—50 cases in 52. Proportion, 1 in $1\frac{1}{25}$, or 96·15 per cent.

Bombay.—120 cases in 195. Proportion, 1 in $1\frac{15}{24}$, or 61·53 per cent.

The following shows the returns according to the severity of the disease in the Guy's Hospital cases.

3 trismus;				1 idopathic and traumatic, recovered, 2 traumatic, died.					
4 chronic;	1	idiopathic,	1	„	„		1	traumatic	recovered.
							1	„	died.
8 subacute;	1	„	1	„	„		1	,	recovered.
							5	„	died.
57 acute;	1	„ fatal,	2	„	„	recovered,	1	„	recovered.
			4	„	„	fatal	49	„	died.
72	3	„	9	„	„		60	„	

Alleged and supposed Causes and Nature of Injury preceding Tetanus.

The severity of the symptoms bears no relation to the degree of local injury.

	Guy's.	Glasgow.	Published Cases.	Bombay. Mr. Peat.
	72	52	171	80 fatal.
1. After major Operations.				
a. Amputations	2	2	8	2[1]
b. Excision of mamma	0	1	0	0
2. After minor Operations.				
a. Extraction of tooth	0	1	1	0
b. Cupping	0	0	1	0
c. Ligature of piles	0	0	1	0
d. Ligature of cord after removal of scirrhous testicle	0	0	1	0
3. Wounds of Soft Parts.				
a. Slight abrasion	6	0	7	0
b. Incised	4	1	11	0
c. Punctured	9	6	34	1
d. Lacerated	24	21	42	16
e. Gunshot	0	0	12	0
4. Contusions	2	2	6	0
5. Burns	5	6	4	0
6. Frostbite	0	0	1	0
7. Fractures.				
a. Simple	1	3[2]	1[3]	1[4]
b. Compound	16	3	19	4[5]
Dislocation, compound	0	0	4	0
8. Ulcers	1	1	2	4
9. Gangrene	2	1	0	0
10. Miscellaneous.				
Laceration of cornea	0	0	1	0
Caries of tibia	0	1	0	0
Fistula in ano, with acute rheumatism	0	1	0	0
Abortion	0	0	1	1
Retained placenta	0	0	1	0
Guinea worm	0	0	0	12
Exposure to temperature	3	2	0	7

[1] Three cases in 7 years; amputation for gangrene.

[2] One combined with lacerated wound of thigh.

[3] Seven others placed among lacerated wounds.

[4] Thigh.

[5] One leg, 3 toes.

Situation of the Injury as noticed in the several Collections.

Guy's—67 Cases.

1. Head, face, and neck	6 Cases		8·95 per cent.
2. Trunk	3 „		4·47 „
3. Arm and forearm	6 „		8·95 „
4. Hand and fingers	28 „		41·79 „
5. Leg and thigh	12 „		17·91 „
6. Feet and toes	12 „		17·91 „

Glasgow—50 Cases.

1. Head, face, and neck	8 „		16· „
2. Trunk	7 „		44· „
3. Arm and forearm	2 „		4· „
4. Hands and fingers	11 „		22· „
5. Leg and thigh	12 „		24· „
6. Feet and toes	10 „		20· „

Bombay—37 Cases. Mr. Peat's return.

1. Head, face, and neck	5 „		13·51 „
2. Trunk	0 „		— „
3. Arm and forearm	1 „		2·7 „
4. Hands and fingers	4 „		10·8 „
5. Leg and thigh	21 „		56·75 „
6. Feet and toes	6 „		16·21 „

Published Cases—169.

1. Head, face, and neck	15 „		8·87 „
2. Trunk	10 „		5·91 „
3. Arm and forearm	14 „		8·28 „
4. Hands and fingers	43 „		25·44 „
5. Leg and thigh	40 „		23·66 „
6. Feet and toes	47 „		27·81 „

Guy's has the highest ratio of wounds of the	hands and fingers		41·79 per cent.
Bombay „ „	leg and thigh		56·75 „
Glasgow „ „	„		24· „
Published Cases „ „	feet and toes		27·81 „

Taking the extremities collectively, we find that tetanus occurred after wounds thereof, at—

Guy's	in 58 cases out of 67,	being	86·56	per cent.	
Glasgow	35 „	50, „	70	„	
Bombay	32 „	37, „	86·48	„	
Published cases	144 „	169, „	85·2	„	

Relative frequency of Tetanus in Injuries and Surgical Diseases.

This consideration has been suggested by Dr. Lawrie in his 'Statistical Report' of the cases occurring in Glasgow: he selects the year of 1847, and gives the following ratio:

After 105 operations	tetanus supervened in	0.
„ 72 wounds	„ „	2 cases, 1 lacerated and 1 punctured.
„ 82 burns	„ „	2 cases.
„ 54 compound fractures	„ „	1 case.
315		5 cases of tetanus.
216 other lesions.		
531		

Respecting an analogous statement from Guy's Hospital we subjoin the following records:

1843.	In 1843 no case of tetanus occurred in the surgical department.
73 operations, major	Two, however, were admitted by the physicians—
82 wounds	1 had abrasion of the finger, with subsequent exposure to cold, followed by gangrene.
112 injuries and contusions	1 exposed to cold whilst body heated. Both died.
56 burns and scalds	
47 compound fractures	
370	
1844.	In 1844
91 major operations	1 case occurred under the physician: the man had a slight prick and got wet the day before he died.
74 wounds	2 followed compound fractures; one of leg, supervened 6 days after admission, and one of finger. Both males and both fatal.
102 injuries and contusions	
46 burns and scalds	
42 compound fractures	

1845, 1846, and 1847, to end of March, collectively recorded. All the cases of tetanus occurred in the surgical department, and all fatal.

239 major operations.	
169 wounds	1 after punctured wound.
273 injuries and contusions.	
149 burns and scalds	2 after burns, both females.
90 compound fractures	3 after compound fractures, one of leg, one of arm, and one of fingers.

1854.	5 Cases of Tetanus.
316 operations, major and minor.	
73 wounds . . .	. 3 cases—2 after abrasions of hand, and fatal; and 1 after laceration of foot, also fatal.
129 injuries and contusions.	
75 burns.	
80 compound fractures .	. 2 cases—1 of thumb and 1 of toe, both fatal.
1855.	4 Cases of Tetanus.
328 operations, major and minor.	
111 wounds . . .	. 1 after contused wound.
75 burns . . .	. 1 after burn.
75 compound fractures .	. 1 after compound fracture of metacarpal bones.
359 abscesses, tumours, ulcers	. 1 after chronic ulcer.
1856.	5 Cases of Tetanus.
317 operations . .	. 1 after amputation of finger for compound fracture.
85 wounds . . .	. 2 after wounds, 1 lacerated, 1 punctured.
55 burns.	
69 compound fractures .	. 1 after compound fracture of finger.
1809 medical admissions .	. 1 idiopathic, subacute, in the medical department.

We offer no remarks on these returns; they are incomplete; they should embrace the whole number of cases, in order to give any satisfactory deduction:—thus, in 1843, 1844, 1854, and 1856, no case of burn was followed by tetanus; and, if we selected these years, the statistic would infer that tetanus rarely followed a burn. Dr. Lawrie takes 1847, and in that year 2 cases of 82 burns were attacked; hence it might be argued, that burns were attacked by tetanus, 1 in 41 cases, or 2·43 per cent.

Respecting the structures injured, as an exciting cause, it is generally acknowledged to be wounds of the nervous system, either the filaments or trunk of a nerve, at the seat of injury. J. Hunter, however, says, "The cases I have seen from wounds were those of the tendons, for these parts heal less rapidly, and the constitution is much weakened by wounds of such parts; wounds being much more irritable here than in other parts, and particularly when attended with loss of blood."

Section VII.—Interval between Injury and Symptoms, or period after Injury at which Symptoms set in.

	Guy's.	Glasgow.	Bombay.	Published Cases.
1 hour	—	—	—	1 (1 recovery.)
4 hours	—	—	—	1 (1 recovery.)
14 „	—	1, after amputation	—	—
1 day	1	—	—	2 (2 recoveries.)
2 days	1	2 (1 recovery)	1	6 (5 recoveries.)
3 „	3[1]	—	—	—
4 „	—	1	4	5 (3 recoveries.)
5 „	6	2	3	12 (3 recoveries.)
6 „	10	4	5	8 (1 recovery.)
7 „	4	4	3	17 (4 recoveries.)
8 „	2	13	1	7 (1 recovery.)
9 „	4[2] (1 recov.)	3	1	10 (6 recoveries.)
10 „	8[3] (2 recov.)	2 (1 recovery)	3	16 (6 recoveries.)
11 „	3	4 (1 recovery)	—	5 (2 recoveries.)
12 „	5 (2 recov.)	5 (1 recovery)	1	10 (4 recoveries.)
13 „	1	1 (1 recovery)	—	4 (2 recoveries.)
14 „	3	—	—	9 (9 recoveries.)
15 „	1[4]	3	—	4 (2 recoveries.)
16 „	1[5]	2 (1 recovery)	3	11 (5 recoveries.)
17 „	—	1	—	4 (3 recoveries.)
18 „	—	—	—	4 (4 recoveries.)
19 „	2[6] (1 recov.)	—	—	2 (1 recovery.)
20 „	—	—	1	2 (2 recoveries.)
21 „	2	—	—	10 (9 recoveries.)
22 „	—	—	—	1 (1 recovery.)
23 „	—	—	—	1
24 „	—	—	1	2 (1 recovery.)
26 „	—	—	—	1 (1 recovery.)
27 „	1[7] (1 recov.)	—	—	1 (1 recovery.)
28 „	3[8]	—	—	2 (1 recovery.)
29 „	—	—	—	1 (1 recovery.)

[1] 1. Bathed after injury.

[2] 1. Exposure after injury.

[3] 1. Exposure after injury.

[4] 1. After amputation on 9th day, and metallic suture on 14th day.

[5] 1. After incision into bursa; a second incision, or the previous wound enlarged, the day before tetanus occurred.

[6] 1. Exposure six days before symptoms set in.

[7] 1. Exposure two days before symptoms set in.

[8] 1. Had also a fall four days before symptoms set in.

	Guy's.	Glasgow.	Bombay.	Published Cases.
30 days	2[1] (1 recov.)	— ...	1 ...	1 (1 recovery.)
31 „	— ...	— ...	— ...	2[2] (2 recoveries.)
33 „	— ...	— ...	— ...	1 (1 recovery.)
35 „	— ...	— ...	— ...	2[3]
49 „	— ...	— ...	— ...	1[4] (1 recovery.)
	63	48	28	166

On further analysis of the above we find that—

I. Previous to the tenth day—

Guy's . . 31 cases in 63, or 49·2 per cent.
1 recovery to 30 deaths.
Glasgow . . 30 cases in 48, or 62·5 per cent.
1 recovery to 29 deaths.
Bombay . . 18 cases in 28, or 64·29 per cent.
Published Cases . 69 cases in 166, or 41·56 per cent.
27 recoveries to 42 deaths.

II. From tenth to twenty-second day inclusive—

Guy's . . 26 cases in 63, or 41·26 per cent.
6 recoveries to 20 deaths.
Glasgow . . 18 cases in 48, or 37·5 per cent.
5 recoveries to 13 deaths.
Bombay . . 8 cases in 28, or 28·57 per cent.
Published Cases . 82 cases in 166, or 49·39 per cent.
50 recoveries to 32 deaths

III. Above twenty-two days—

Guy's . . 6 cases in 63, or 9·52 per cent.
3 recoveries to 3 deaths.
Glasgow . . No cases.
Bombay . . 3 cases in 28, or 10·71 per cent.
Published Cases . 15 cases in 156, or 9·03 per cent.
10 recoveries to 5 deaths.

It is asserted, and generally maintained to be correct, that tetanus occurring over twenty-two days after the injury has been inflicted is more liable to be recovered from; that the more sudden the onset from the receipt of injury the more fatal will be the result. With respect to the latter circumstance, the Guy's Hospital and Glasgow returns perfectly

[1] { 1. Exposure four days before symptoms set in.
1. Removal of phalanx on same day as the attack came on.

[2] Both gunshot wounds, and healed at the time. Occurred in May and August.

[3] One followed gangrene after crush; and one supervened on a chronic ulcer.

[4] No wound, but a blow on the side, in the month of May.

coincide; whereas the return of the Published Cases give a far different ratio, supposing the data to be correct and to be relied upon. It states that—

1 case supervening	1	hour	after the wound,	recovered
1 „	4	hours	„	„
2 „	1st	day	„	„
5 „	2d	„	„	„
3 „	4th	„	„	„

The following summary, however, will show the ratio in general proportion:

		Mortality compared with cases occurring during the period.	Mortality compared with total cases.
I. Previous to the tenth day—			
Guy's . .	31 cases, 30 died	96·77 per cent.	47·61 per cent.
Glasgow . .	30 „ 29 „	96·66 „	60·41 „
Published Cases .	69 „ 42 „	60·86 „	25·3 „
II. From the tenth to the twenty-second day inclusive—			
Guy's . .	26 cases 20 died	23·07 per cent.	31·74 per cent.
Glasgow . .	18 „ 13 „	72·22 „	27·08 „
Published Cases .	82 „ 32 „	39·02 „	19·27 „
III. Above twenty-two days—			
Guy's . .	6 cases 3 died	50·00 per cent.	4·76 per cent.
Published Cases .	15 „ 5 „	33·33 „	3·01 „

The above confirms Mr. Travers's remarks, that the "*interval preceding the attack does not determine the form of the disease,*" *i. e.*, the disease is sometimes of the severest and most rapid description where an interval of ten days has elapsed.

On the other hand, when the disease follows close upon the injury, it is for the most part uncontrollably rapid and fatal.

Section VIII.—State of the Wound at the time when Tetanus set in.

Mentioned in 61 cases at Guy's, 38 cases at Glasgow, and 100 cases of the Published Collection.

1. *Nothing remarkable.*				
Guy's . . .	4 cases	6·55 per cent.,	all fatal.	
2. *Quite recent.*				
a. Guy's . . .	1 case	1·63 per cent.	1 fatal.	
b. Glasgow . .	1 „	2·63 „	1 „	
c. Published Cases	4 „	4· „	—	4 recoveries.

3. *Inflamed or suppurating.*

a. Guy's . . .	16 cases	26·22 per cent.	15 fatal	1 recovery.	
b. Glasgow . .	6 „	15·86 „	all fatal.		
c. Published Cases .	22 „	22· „	14 „	8 „	

4. *Unhealthy, sloughing, and gangrenous.*

a. Guy's . . .	19 cases	31·14 per cent.	16 fatal	3 recoveries.	
b. Glasgow . .	16 „	42·1 „	14 „	2 „	
c. Published Cases .	22 „	22· „	10 „	12 „	

5. *Scabbed over; healing; nearly healed; healthy.*

a. Guy's . . .	14 cases	22·95 per cent.	13 fatal	1 recovery.	
b. Glasgow . .	15 „	39·46 „	12 „	3 „	
c. Published Cases .	41 „	41· „	20 „	21 „	

6. *Healed or said to be healed.*

a. Guy's . . .	7 cases	11·47 per cent.	5 fatal	2 recoveries.	
b. Glasgow . .	0 „	— —	—	—	—
c. Published Cases .	11 „	11. „	7 „	4 „	

The state and condition of the wound has been noticed and associated among the causes of tetanus.

A. *Quite recent*, before either inflammation or suppuration has come on. The returns give but very few, an average of only 3·01 per cent.; and thus totally opposed to the opinion expressed by John Hunter.—"Tetanus arises also from slight wounds before either inflammation or suppuration comes on. They are generally the most frequent. It is from irritation."

B. *Inflamed or suppurating* bears an average of 22·11 per cent. John Hunter makes also an observation on this point. Tetanus, "when arising from considerable wounds; it was after the inflammatory stage, and when good suppuration was come on." The return coincides with Dr. Lawrie's remark that this state is not the most common antecedent.

Larrey attributes the suppression of the discharge of a suppurating surface as a cause of tetanus.

C. *Unhealthy, sloughing, and gangrenous.*—28·5 per cent.

D. *Healthy, healing, and scabbed over.*—There is a very large proportion of the cases under this head, an average of 35·17 per cent.

E. *Healed.*—Dr. Lawrie states that from his own experience he has never seen tetanus supervene upon a "healed" wound. He doubts even the 11 cases said to be "healed" amongst the Published Collection.

Guy's gives no less than 7 cases; but this must not be taken as strictly correct, for in 6 of these cases the observation was made several days after the commencement of the attack—1 on third day of attack, 2 on fifth day, 1 on tenth day, 1 on twelfth day, and 1 on fifteenth day; so that really

there was only one case wherein it was observed that the wound was actually healed at the time of the occurrence of tetanus. Thus, the general opinion that cicatrization is mostly complete on the accession of tetanus proves erroneous.

Travers offers the following explanation with regard to the two latter conditions :

"In flesh wounds the period of commencing cicatrization, after the mundifying process is completed, seems to be most liable to the attack of spasm. It is difficult to disconnect the phenomena of the incipient spasm with the altered condition of nervous and muscular structure in the healing or newly cicatrized part. Cicatrization is adhesion and fastening of parts before free and moveable on each other, and its effects would be equivalent to its strangulation or confinement by pressure of any kind, the interruption to its function being the same."

Section IX.—Peculiarity of the Symptoms.

The symptoms of tetanus, from its commencement through its progress to its termination, are pretty uniform, and are those generally detailed in surgical works. However, there are certain and unusual peculiarities to be met with in individual cases, and it is to these only that we shall now advert, and offer such slight records as have been kept thereof.

A. Premonitory symptoms.

In only 4 cases has any notice been taken of this circumstance ; it is recorded as follows :

Before the attack came on, 1 had darting pains from the wound up the arm, another had the same up to the axilla, twenty-four hours before the attack ; a third was preceded by pain in the wound, and severe pain in the back ; and the fourth had great pain in the wound previously. All died.

B. Active stage of the disease.

1. *Spasms and convulsions of voluntary muscles.*

a. Mild in character	.	5 recovered	.	5 fatal.
b. Severe and intense	.	3 „	.	44 „

c. More on right side, 1 female, æt. 24, fatal.

2. *Deglutition affected*, noticed especially in only 29 cases.

   a. Easy . 2 recovered . 5 fatal.
   b. Difficult . 2 „ . 20 fatal, and 1 of these idiopathic.

3. *Respiration and affection of laryngeal muscles*, mentioned in 11 cases,

   a. Easy, performed by abdominal muscles, 1 recovery.
   b. Difficult and severe, 3 recovered and 7 died.

4. *Countenance*, described as livid in 2, and cheerful in 1. All died.

5. *Circumstances exciting the paroxysms*, adverted to in 10 cases.

   a. Slightest noise in 2, fatal.
   b. „ touch in 2, fatal,
   b. „ attempt to swallow in 4, fatal.
   c. „ gust of air in 2, 1 fatal and 1 recovery.

6. *Muscles of face specially affected*, remarked in 3 cases, 1 recovery.

   Two cases involving the muscles of the face, with special affection of the orbicularis palpebrarum, causing closure of the lids, and simulating ptosis; 1 died, 1 recovered.

7. *Cerebral complications*, *&c.*, in 5 cases.

   a. Delirium, 2 cases, towards close of the disease, fatal. Another case had delirium before the attack, but which entirely subsided directly, tetanus set in; this case also died.
   b. Coma, 1 case, and died comatose, probably the result of the large doses of morphia administered.
   c. Epilepsy, case, in a female, æt. 25, subject to epilepsy; tetanus supervened a few days previous to the expected attack; was complicated with screaming and convulsions, partaking those of periodic epileptic seizures. An acute case, and fatal.
   d. Convulsions and screaming; female, æt. 25; acute tetanus following an incision into an inflamed bursa. On sixth day of attack had paroxysms of shrieking and convulsions. Fatal.

8. *Miscellaneous complications*, in 9 cases.

   a. Skin of abdomen peculiarly shrivelled in a man, æt. 62, fatal.
   b. Inability to micturate in a female, æt. 23, fatal.
   Retention of urine on the 5th day in a male, æt. 13, fatal.
   c. Loss of power over arms and legs in 1 case, recovered.
   „ „ left hand in 1 fatal case.
   d. Accompanied with chronic bronchitis, 1 female, æt. 38, fatal.
   „ „ and laryngitis, also in a female, æt. 24, and fatal.
   e. In one case the symptoms continued severe until 9th day, and on the 11th miliary eruption appeared over the whole body, accompanied with succession of spasms and intervals of repose. On the 16th day exhaustion and rambling supervened; but on 22d day subsidence of symptoms and protracted recovery.
   f. One fatal case had constipation for 8 days previous to the attack of tetanus.
   g. Complicated with erysipelas, fatal on 28th day.

9. *Mistaken for other diseases*, in 3 cases.

a. Rheumatism. Two cases were treated and mistaken for rheumatism previous to admission. They were both subacute cases, and recovered.

c. Hydrophobia. One fatal case was supposed by some to be hydrophobia from its severity, but was disproved. There was apparent recovery at one time, when sudden collapse came on and speedy death.

10. *Remission of symptoms* in 4 cases.

In 2 there was relief of the symptoms for 13 days, but exhaustion ensued and death resulted.

In 1 the symptoms were relieved for many days, but was afterwards fatal.

In 1 there was remission for 2 days only, when the symptoms became intense and fatal.

In one case the heart's action continued for some time after the patient had ceased to breathe.

c. Decline.

I. Fatal, *and mode of dying*, in 62 cases.

*	*a*. During a paroxysm with spasm and convulsions .	19 cases.
**	*b*. Asphyxia and suffocation . . .	13 „
	c. Exhaustion	10 „
	d. Spasm and exhaustion . . .	2 „
	e. Combination of tetanus and erysipelas . .	1 „
	f. Comatose, probably from large dose of morphia .	1 „
	g. Not stated	16 „
		62

* One died suddenly while being raised in bed.
„ during the administration of an enema.
„ whilst drinking.
„ immediately after the extraction of a tooth for the purpose of feeding.

** One of these died suddenly whilst at stool.

II. *Recovery*, in the majority protracted.

Section X.—Duration of the Disease in Fatal Cases.

	Guy's.	Glasgow.	Bombay. Mr. Peat.	Published Cases.
Few hours, 4 or 5	1	—	—	—
½ to ¾ of a day	1	1	—	1
1 day	2	2	3	14
1¼ to 1⅓ day	—	4	—	1
1½ day	—	3	—	1
1¾ day	3	—	—	2
2 days	3	7	9	17
2½ „	2	—	1	—
3 „	5	7	6	7
3½ „	—	—	1	—
4 „	11	5	12	11
4½ „	—	—	1	—
5 „	4	3	10	4
5½ „	—	—	1	—
6 „	5	1	9	1
7 „	10	3	5	5
8 „	2	1	7	1
9 „	—	3	3	2
10 „	2	1	1	3
11 „	—	—	1	—
12 „	2	—	—	1
13 „	—	—	2	—
13½ „	—	—	1	—
14 „	2	—	1	3
16 „	1	—	1	1
17 „	—	—	—	1
18 „	—	—	1	—
19 „	1	—	1	1
21 „	1	—	1	—
22 „	2	—	—	—
28 „	1	—	2	1
32 „	1	—	—	—
39 „	—	—	1	—
Total	62	41	81	78

Statistics and Deductions derived from the foregoing Table.

A. *Cases fatal in 2 days.*

a. Guy's . . 10 in 62 cases, 16·12 per cent.
b. Glasgow . . 17 in 41 „ 41·46 „
c. Bombay . . 12 in 81 „ 14·81 „
d. Published Cases . . 36 in 78 „ 46·15 „

Thus Bombay and Guy's returns are small in comparison with the high returns of Glasgow and Published Cases during this period.

B. *Cases fatal above* 2 *days to the* 5*th day inclusive.*

a. Guy's	22 in 62 cases,	35·48	per cent.
b. Glasgow	15 in 41 „	36·58	„
c. Bombay	31 in 81 „	38·27	„
d. Published Cases	22 in 78 „	28·2	„

The Published Cases give the lowest number, the Bombay the highest.

C. *Cases fatal over* 5 *days to the* 10*th day.*

a. Guy's	19 in 62 cases,	30·64	per cent.
b. Glasgow	9 in 41 „	21·95	„
c. Bombay	26 in 81 „	32·09	„
d. Published Cases	12 in 78 „	15·38	„

The Published Cases here again give the lowest ratio, and the Bombay the highest; although the Guy's return is almost equal to the Bombay.

D. *Cases fatal over* 10 *days to the* 22*d day.*

a. Guy's	9 in 62 cases,	14·51	per cent.
b. Glasgow, no cases.			
c. Bombay	9 in 81 „	11·11	„
d. Published Cases	7 in 78 „	8·98	„

E. *Above the* 22*d day to the longest recorded period,* 39*th day.*

a. Guy's	2 in 62 cases,	3·22	per cent.
b. Glasgow, no cases.			
c. Bombay	3 in 81 „	3·7	„
d. Published Cases	1 in 78 „	1·28	„

With regard to the latter return, it will considerably modify a statement which is generally quoted in surgical works, viz., that if tetanus continue over a period of twenty-two days, a favorable issue is to be expected, and recovery certain. Yet no less than 3 per cent. of the Guy's and Bombay cases were fatal over this period; in Guy's on the twenty-eighth and thirty-second day; Bombay, two on the twenty-eighth day and one on the thirty-ninth day. The single one of the Published Cases was fatal on the twenty-eighth day.

By collecting the returns into two classes, we shall arrive at another important result, and give a much more practical

deduction, as showing the mortality up to the fifth day being equal to or higher than all the remaining cases.

F. *Returns of fatal cases up to 5th day.*

a. Guy's	32 in 62 cases,	51·61	per cent.
b. Glasgow	32 in 41 „	78·04	„
c. Bombay	43 in 81 „	53·08	„
d. Published Cases	58 in 78 „	74·35	„

Thus the Guy's and Bombay returns are nearly alike, being a little more than half of the total number of cases. The Glasgow and Published Cases have a higher return, being three fourths of total cases.

G. *Returns of fatal cases above 5 days.*

a. Guy's	30 in 62 cases,	48·38	per cent.
b. Glasgow	9 in 41 „	21·95	„
c. Bombay	38 in 81 „	46·97	„
d. Published Cases	20 in 78 „	25·64	„

Has the season of the year any influence on the short duration or protraction of the disease?

The following Table will show that there are no grounds for such a supposition. The figures indicate the number of days each case lasted:

	Guy's.	Glasgow.	Published Cases.
January .	2, 3, 4, 7, 7, 12 .	½, 1⅓, 1⅓, 2, 2 .	1, 1⅓, 1¾, 2, 2, 3, 4, 5, 7, 17.
February.	3, 14 .	1¾, 2, 3, 9 .	2, 5, 7, 16.
March ..	1, 2½, 6 .	1½, 2, 3, 4, 5, 7	1, 1, 2, 14.
April ...	5 hours, 3, 5, 7, 8 .	2, 5, 5, 10 .	1, 3, 4, 6.
May	8, 10, 12, 21 .	1½, 3, 7 .	1, 1¼, 4, 14, 19.
June ...	1¾, 2, 3, 4, 4, 5, 5, 6, 7, 7	1, 2 .	1, 2, 4, 12.
July	1¾, 6, 7, 7, 14, 16 .	3, 3, 3, 4, 4 .	2, 2, 5, 10.
August ..	4, 4, 4, 4, 22 .	1⅓ .	1, 2, 9.
Sept. ...	2, 5, 19 .	4, 7 .	1, 3.
Oct.	¾, 1¾, 6, 6, 7, 8, 32 .	1, 3, 4, 6, 8 .	¾, 1, 1, 1, 1¾, 2, 2, 4, 4, 4, 4, 7, 14.
Nov. ...	2¼, 3, 4, 4, 4, 7, 7 28 .	2, 9 .	1, 1, 2, 2, 2, 2, 3, 4, 4, 7, 7, 10.
Dec.....	1, 4, 22 .	1½, 9 .	1, 2, 2, 3, 4, 5, 8, 28.

Thus, taking Guy's cases in October, one was fatal in three-fourths of a day, whilst another lasted as long as thirty-two days.

Section XI.—Post-mortem Appearances of the Cases of Tetanus examined at Guy's Hospital.

Of the 62 deaths, 18 were not examined, 44 were examined, but of these only 34 inspections recorded.

I. The brain—examined in 20 cases.

a. Healthy.—6 cases. 1 fatal in 40 hours from spasm, and examined 12 hours after; 1 fatal in 5 days; 1 in 6 days, where the examination was made 7 hours after death; 1 in 7 days, from sudden death; 1 in 8 days, a case of idiopathic tetanus; and 1 in 12 days, from exhaustion, and the examination made 7 hours after death.

b. Healthy and firm.—2 cases. 1 fatal in 28 days, complicated with erysipelas, and found to have an encysted abscess in hemisphere of brain, near the external wound; and 1 fatal in 4 to 5 hours, a case of burn, post-mortem made 47 hours after death, in the month of April.

c. Described as nothing remarkable.—2 cases. 1 where it was fatal in 24 hours, during paroxysm; and 1 in 4 days, also during a paroxysm, and examined 31 hours after death.

d. Congested.—4 cases. 1 fatal in 3 days, from exhaustion; 1 in 50 hours, from spasm, examined 31 hours after; 1 fatal in 2 days, from suffocation, post-mortem in January, 70½ hours after; and 1 fatal in 7 days, from exhaustion, examined 50 hours after; brain exceedingly congested.

e. Darker than natural.—1 case. Fatal in 14 days, from spasm and examination made 33 hours after, in the month of February.

f. Dark and flabby.—1 case. Fatal on 3d day.

g. Pinkish.—1 case. Fatal on 7th day, from asphyxia; post-mortem 21 hours.

h. Ulceration on under surface of anterior lobes, the result of injury to the head, coexisting with tetanus. Fatal on 21st day, during paroxysm.

i. Decomposed.—1 case, although body rigid, and examined 41 hours after death, in month of August. An acute case, and fatal in 4 days.

k. Nothing morbid in colour or consistence in a case of sudden death on the 5th day, and the examination made 6 hours after death.

II. Spinal cord—examined in 19 cases.

a. Healthy, and no traces of inflammation.—5 cases. 1 fatal in 40 hours, from spasm, examined 12 hours after; 1 in 5 days, fatal, sudden death, and examined 6 hours after; 1 in 6 days, and examined 7 hours after, but no inflammatory cells detected by the microscope; 1 in 8 days; and 1 fatal in 12 days from exhaustion.

b. Healthy and firm.—2 cases. 1 fatal on 3d day; and 1 fatal in 4 or 5 hours, when the post-mortem was made in the month of April, 47 hours after.

Firm and rigid, of pinkish hue.—1 case. Fatal in 22 days, and examined 21 hours after.

Natural firmness, but injected.—2 cases. 1 fatal in 4 days, from suffocation; and 1 fatal in 4 days, from spasm, examined 14 hours after, no inflammatory product detected.

c. Nothing remarkable.—1 fatal case in 4 hours, during paroxysm, and examined 23 hours after.

d. Congested.—2 cases. 1 fatal in 3 days, from exhaustion; and 1 exceedingly congested, fatal in 7 hours, and examined 50 hours after.

e. Darker than natural.—1 case. Fatal in 14 days, from spasm, and examined in 33 hours.

f. Pinkish.—2 cases. 1 fatal on 7th day, from asphyxia, and examined 21 hours after; and the other fatal on 3d day, from spasm, and examined in 13 hours.

Higher tint in 1 fatal on 2d day, from suffocation, and examined 70½ hours after, in the month of January.

g. Softened.—1 case. Fatal in 32 days, from exhaustion; examined 48 hours after, in the month of October, the body being decomposed.

h. Decomposed.—1 case. Fatal on 4th day, from spasm; examination 41 hours after, in August, 1856; body decomposed, although it was still rigid.

i. Increase of cerebro-spinal fluid and plates of bone on the spinal arachnoid in the fatal idiopathic case. Here the brain and cord were perfectly natural.

III. Nerves at the seat of the wound—14 cases.

a. Healthy—2 cases. 1 fatal in 40 hours; and the other fatal on the 6th day, and examined 7 hours after.

b. Unaffected.—1 case. Fatal in 24 hours.

c. Inflamed.—5 cases.

1, the portio dura, in a considerable degree, increased in vascularity; it was of a dark-reddish colour, was thickened and slightly softened; the infra orbital nerve was healthy; fatal in 5 days.

1, the median and ulnar nerves, at the seat of the wound; fatal in 5 days.

1, the digital nerves of the fore-finger inflamed to the extent of an inch; and fatal in 13 days.

1, the dorsal branch of the ulnar nerve entirely lacerated, ends swollen and injected; fatal on 8th day, and examined 16 hours after.

1, the posterior tibial nerve inflamed and softened, in consequence of the fractured ends of bone pressing on it; fatal in 19 hours.

d. Divided nerve united.—2 cases.

1, after an incised wound, and not inflamed; fatal on 21st day, and examined 5 hours after.

1, united by coagulum; fatal on 4th day, and examined 14 hours after.

e. End of nerve bulbous.—1 case. Radial nerve divided, and ends bulbous; fatal on 7th day, and examined 21 hours after.

f. Filaments of radial nerve entered the cicatrix, and were pinkish.—1 case. Fatal on 7th day.

g. Filaments of facial nerve spread over the ulcer, but condition not stated.—1 case. Fatal in 6 days, and examined 26 hours after.

h. Divided sciatic nerve, after amputation of the thigh, lay exposed in the stump to the extent of two inches; granulations around and over it; no evidence of inflammation in it, and appeared healthy.—1 case. Fatal in 60 hours.

IV. Condition of the wound.

1, healed over, and suppuration about the cicatrix; fatal in 28 days.
1, nearly cicatrized; fatal on 7th day.
1, wound in foot, from rusty nail; case fatal on 5th day; was very small, it did not seem to have completely closed, nor did the fatty cellular membrane appear quite healthy where the nail had penetrated.
1, pus burrowed from wound at wrist, among the deep muscles half way up the arm; case fatal on 8th day.
1, considerable suppuration above the wound, in a case fatal on 4th day of attack and 14th of wound.

V. State of the Heart—16 Cases.

a. Stated to be healthy—1 case, fatal in 4 days.

b. Stated to be large, 1 case, fatal in 5 days.

c. Nothing remarkable, 1 case, fatal in 32 days from exhaustion.

d. Cavities not distended with blood, 1 case, fatal, in 50 hours from spasm.

e. Right side—1, *slightly loaded*, fatal in 21 days during a paroxysm.
1, *flaccid, and left side firmly contracted*, fatal in 14 days from spasm and syncope.
1, *distended with fluid blood, and left firmly contracted*, fatal in 50 hours from spasm.
3, *full of coagulum*, 1 fatal in 40 hours, 1 in 6 days, and 1 in 7 days, all from spasm.

f. Both sides containing blood—5 cases.
2, *blood dark and fluid*, full in quantity—1 idiopathic and fatal in 8 days, 1 traumatic, fatal in 6 days from suffocation.
1, right side more than usually distended with dark fluid blood, and on the left side the same, but quantity smaller; the case was fatal on the 4th day from spasm.
1, both sides contained a firm clot in a case fatal in 4 or 5 hours.
1, both cavities contained soft clots in a case fatal on 7th day from asphyxia.

g. Heart violently contracted in a case fatal on 2nd day from suffocation, and where laryngotomy was performed.

VI. Lungs—28 Cases.

a. Healthy—6 cases. 1 fatal in 4 or 5 hours (burn of 9 days); 2 fatal in 7 days, 1 from exhaustion and 1 from asphyxia; 1 fatal in 8 days; and 1 fatal in 28 days. Healthy, and no remarkable emphysema in 1 case fatal in 21 days during a paroxysm.

b. Emphysematous—4 cases. In 2 cases of sudden death fatal in 2 and 7 days; 1 general vesicular emphysema, but no evidence of inflammation, in the fatal idiopathic case of 8 days; 1 emphysematous and apoplectic, fatal on 2nd day from suffocation.

c. Œdematous—2 cases. 1 combined with old pleuritic adhesion, an acute case, fatal on 7th day from spasm; 1 combined with congestion and effusion into the pleural cavity of ℥iss of fluid, fatal in 14 days from spasm and syncope.

d. Congested—7 cases. 1 fatal in 40 hours from spasm; 2 fatal in 6 and 12 days from exhaustion, the first of which had chloroform; 1 congested, free from pneumonic consolidation but emphysematous at the edges and old adhesion, case fatal in 5 days; 1 congested, and the base somewhat hepatized, old adhesion in a boy, æt. 12, fatal in 12 days from exhaustion; 1 turgid, with old band of adhesion, fatal in 50 hours during a spasm (tetanus supervened on burn of 10 days); 1 gorged with blood and healthy, with recent bronchitis and laryngeal disease in female, fatal in 6 days from suffocation

e. Pneumonic—3 cases. 1 fatal on 4th day (tetanus supervened on extensive burn of 9 days); 1 fleshy, not distended, case fatal in 3 days from exhaustion; 1, in part slightly consolidated in a case fatal on 4th day during a paroxysm.

f. Apoplectic—4 cases. 1, in a case fatal on 2d day from suffocation, and where laryngotomy was performed; 1 case fatal on 3d day; 1 fatal on 6th day; 1 apoplectic and congested in a boy, æt. 11, fatal in 6 days, and where chloroform inhalation had been given for 15 hours.

g. Tuberculated—2 cases. 1 strumous tubercles, with indurated apex, in a male, æt. 22, tetanus following amputation of thigh for strumous disease of knee-joint, see case 72; 1, small inactive tubercles with slight induration of right lung, and was pretty generally adherent, in a case, æt. 70, fatal on 32d day.

VII. Larynx.

Larynx, detailed in 4 cases:

1, where the epiglottidean folds were caught in the rima, thus closing larynx, in a case fatal on 4th day during a paroxysm.

1, described as being free in a case fatal on 14th day from spasm and syncope.

1, epiglottis extensively diseased and thickened, interfering with air-passages, female, fatal in 6 days from suffocation.

1, no signs of inflammation in an acute case, fatal on 7th day from spasm.

VIII. Bowels, noticed in 18 Cases.

a. Healthy—12 cases. 1 in a case fatal in 2 days from suffocation; 1 fatal in 2½ days from spasm; 1 fatal in 3 days; 1 fatal in 6 days from suffocation; 1 fatal in 7 days from spasm (an acute case); 1 fatal in 14 days from spasm and syncope; 1 fatal in 28 days

1 healthy but had ascarides in the rectum, fatal in 50 hours during a paroxysm.
2 healthy, *not at all contracted;* 1 in a case fatal on 32d day from exhaustion, and 1 distended with gas, but *contained no feculent matter*, in a case fatal in 21 days during a paroxysm.
2 described as having no unnatural appearance, one was fatal on 5th day.

b. Contracted—in 2 cases. 1, where the whole of the small intestines were so greatly contracted as to resemble those of an infant, in a case fatal in 40 hours from spasms; the other also much contracted, but healthy, in a case fatal in 6 days; here chloroform had been inhaled for 16 hours.

c. Distended—2 cases. In 1 case the colon greatly distended and having a remarkably peculiar course; the cæcum full of feculent matter; it was an idiopathic case and fatal in 8 days; in 1 case, fatal on 7th day from asphyxia, the colon was distended with fæces.

d. Congested—2 cases. 1 slightly so, but otherwise healthy; in addition, there was an intussusception at the middle of the ileum, probably post-mortem, in a boy, æt. 10, and fatal in 12 days from exhaustion; 1 case of congestion of the ileum, rendering Peyer's patches well marked, the mucous follicles throughout the small intestines of very large size; the cæcum also congested, but duodenum healthy; fatal in a few hours (tetanus supervened on burn of 9 days standing).

IX. Spleen—10 Cases observed.

a. Healthy—4 cases. 1, æt. 10, fatal in 12 days; 1, æt. 14, fatal in 7 days; 1, æt. 22, fatal in 14 days; 1, æt. 9, fatal in a few hours (tetanus supervened on burn of 9 days).

b. Firm—2 cases. 1, æt. 9, fatal in 50 hours (tetanus supervened on burn of 10 days); 1 small, pale and firm, in a case, æt. 11, and fatal in 6 days.

c. Soft—4 cases. 1 small and soft and tunic covered with small cartilaginous spots, in a case, æt. 70, and fatal in 32 days from exhaustion; 1 pale and soft, in a female, æt. 30, and fatal in 21 days; 2 soft and large, and full of blood, in a female, æt. 24, and fatal in 6 days, and a male, æt. 22, fatal in 60 hours.

X. Sympathetic system.

1. In neck, chest, and abdomen, minutely examined, but considered perfectly healthy, in a case fatal in 40 hours, and examined 12 hours after.

XI. Muscular system.

1 case muscular fibre examined, in acute case, fatal on 6th day (case 58). It is stated to have been very granular, and under one-eighth magnifying power, like muscular fibre of the heart undergoing degeneration.

XII. Body—Noticed in 7 Cases.

a. Rigid.

1. In an idiopathic case fatal on 8th day in the month of May.
2. In a traumatic case, fatal on 21st day during a paroxysm, examined 5 hours after, in the month of May.

3. Where decomposition had already set in. The case was fatal on the 4th day from spasm, and examined 41 hours after, in the month of August, during warm and moist weather.
4. In a case fatal in 50 hours, and examined 31 hours after, in the month of November.
5. Increase of the rigidity of all the muscles after death, much more than they had been before, in 1 case fatal on the 6th day from suffocation, and occurring in the month of July.
6. Of the extremities in a case fatal on the 7th day from asphyxia, and examined 21 hours after, in the month of June.

b. *No rigidity* in 1 case fatal on the 4th day, and examined 23 hours after death, in the month of November.

Section XII.—The Treatment adopted.

A. The local measures used in the Guy's Hospital Cases:

1. *Laying freely open the wound* adopted in 3 cases, which were fatal; and in a 4th case some loose bone removed, but also fatal.
2. *Amputation* performed in 2 cases: 1 fatal, the other only had slight trismus and recovered.
3. *Division of the nerves near the seat of the wound*, in 1 case, where there was section made of the anterior and posterior tibial nerves, fatal.
4. *Applications.*
   a. *To the wound*, noticed in 14 cases.—Ung. cantharid., and afterwards Black wash in a successful case; Ung. canth., and afterwards morphia in a fatal case; Blisters to cicatrix twice, producing discharge in 1, fatal; Nitric acid lotion in 2 fatal cases; Belladonna in 1, fatal; Aconitine in 2, fatal; Belladonna and Aconitine in 1, fatal; Opium in 2, fatal; Morphia in 1, fatal; Extr. conii. in 1, fatal; Turpentine in 1, fatal.
   b. *To the spine*, observed in 9 cases.
      1. *Leeches* 20, at 9 successive times without benefit.
      2. *Blisters* in 5 cases; 1 applied on the 13th day; 1 with relief, 1 dressed with opium; all fatal.
      3. Ung. veratriæ in 2 cases, fatal.
      4. Aconitine in 1, also fatal.
   c. *To the abdomen and region of the diaphragm.*
      Belladonna liniment in 2 cases, fatal.
      Aconitine in 1, also fatal.
   d. *To the neck, spine, and abdomen*—aconitine in 1, fatal.
5. *Baths.*
   a. *Warm* in 2 cases, fatal.
   b. *Cold*, 0.
   c. *Vapour* in 1 case with relief, but fatal.
   d. *Shower* in 1 case, twice administered and with bad effect, although the case ultimately recovered.
6. *Extraction of a tooth* in order to administer food, in 1 case, followed by immediate death.

B. CONSTITUTIONAL TREATMENT.

1. *Antiphlogistics.*
   - *a. Bleeding* in 4 cases; all fatal.
   - *b. Purgatives* in the majority of the cases.
   - *c. Calomel* in 21 cases. Amongst these are two recoveries, but no benefit attributed to this remedy.
   - *d. Antimony* in 5 cases; fatal.
   - *e. Colchicum* in 4 cases; fatal.
2. *Sedatives.*
   - *a. Digitalis*, no case.
   - *b. Tobacco* in only 2 cases, and employed as enemata; both fatal. One was completely prostrated by the remedy, and hurried on to a more rapid termination.
   - *c. Hydrocyanic acid* in 3 cases; fatal.
   - *d. Aconitine* in 6 cases, but in all used as a local application; all fatal.
3. *Anodynes and Narcotics.*
   - *a. Opium*, mentioned as being given in 35 cases, although probably administered in the majority; in most of the recoveries it was administered, but only occasionally, for in 1 only was it regularly given.
   - *b. Morphia* in 5 cases; fatal.
   - *c. Belladonna* in 1 case, internally; and in 4 locally; all fatal.
   - *d. Cannabis indica* in 3 cases, 1 of which was idiopathic; all died.
   - *e. Ether;* 1 had the vapour of ether administered per rectum, with passing relief; fatal.
   - *f. Chloroform* administered in 4 cases; all fatal, with temporary relief in 1, and aggravation in the others.
4. *Stimulants.*
   - *a. Musk* in 2 cases; 1 fatal, and 1, an acute case, recovered.
   - *b. Ammonia* in 2 cases; fatal.
   - *c. Wine*, mentioned in only 15 cases, but probably in a larger number; 4 of the recoveries had wine.
   - *d. Turpentine* used as an enemata in many of the cases, but only 14 recorded.
   - *e. Assafœtida* in 2 cases, as an enema; fatal.
   - *f. Stimulants*—general term used, not specifying the agent—in 10 cases, 1 of which recovered.
5. *Tonics.*
   - *a. Vegetable.*
     1. *Quinine* in 25 cases; 7 recoveries.
     2. *Bark* in 1 case.
     3. *Strychnia*, no case.
   - *b. Mineral.*
     1. *Iron*, no case.
     2. *Zinc* in 2 cases, one of which recovered.
6. *Hygienics and dietetics.*

   Support mentioned in 13 cases only; but the greater number must have been so treated, it being the usual practice at Guy's. In 6 cases the patients were fed by nutritive enemata; and in 1 case, which recovered, the patient was entirely fed per rectum for 3 days.

7. *Laryngotomy* in 1 case; fatal.

No instances of injection into the veins, or the application of galvanism and electricity.

We have thought fit to take out the recoveries and place them together, so that one may judge what influence remedies may have over such a powerful disease.

Constitutional Treatment of the ten Recoveries.

1.—M., 14. Bite of a dog. Ulcer followed. Symptoms on 10th day. Admitted on the 11th day of attack. Case of CHRONIC tetanus. 1 month duration. Antiphlogistic at first, but no benefit. Tonics, Zinci. Sulph., gr. ij, every 6 hours. Support and purgatives.

2.—M., 24. *Acute* tetanus. Compound fracture. Fourteen days after protruded tibia sawn off. Twenty-seven days after admission symptoms came on. Two days previous to attack *exposed to draught* of open window over his bed. Severe on 3d day, and continued up to 9th day. Slow and protracted recovery; opium and castor oil; musk increased up to gr. xxv every 4 hours, and afterwards reduced to grs. x; wine and support, followed up by tonics.

3.—M., 38.—*Idiopathic*, one or two excoriations on fingers. *Exposure to great heat*, and whilst in perspiration threw off his jacket. Admitted on 5th day. Recovery 29 days. Antiphlogistic at first. Afterwards, quinine in large doses ℥ ii in 20 days; wine.

4.—M., 29. *Chronic*, jambed fingers. *Had been previously exposed to wet and damp.* Admitted on 10th day of attack. Symptoms gradual. Aggravation on 14th day. At first low diet and colchicum as a purgative; 4 days after admission quinine and wine. Recovery 1 month.

5.—M., 11. *Subacute.* Lacerated wound of leg, exposing post. tibial nerve. Symptoms 12 days after admission. Gradual, mild. Trismus and affection of respiratory muscles. Amputation of leg on 3d day of symptoms. Recovery. Died 15 days after recovery from symptoms of phlebitis.

6.—M., 24. *Subacute.* Crushed ring-finger and amputation. Subsequent inflammation. *Exposure to cold.* Symptoms 10 days after operation and 1 day after exposure. Supervened on 4th day after admission, and 1 day after exposure to cold. Quinine grs. v in solution every 3 hours; free use of stimulants and occasional opiates.

7.—M., 18. *Subacute.* Right fore-arm crushed. Gangrene followed. On 15th day division of ligaments of elbow-joint and median nerve to assist spontaneous separation. Symptoms 6 days after operation and 19 days after primary injury. Quinine, grs. iij, every 3 hours; opiates.

8.—M., 28. *Idiopathic chronic.* No history of injury or exposure. Came on after severe purging. Admitted on 5th week of attack. Previously treated for rheumatism with mercury. Quinine, grs. iij, ter die; and wine; recovery 3 weeks after admission.

9.—M., 53. *Acute.* Lacerated wound on nose from fall. *Subsequent exposure to wet.* Symptoms 6 days after exposure. Admitted on 5th day of attack. Quinine, grs. iv, every 4 hours; required feeding by enemata for 2 days; support.

10.—M., 23. *Subacute. Exposure to cold.* No injury. Admitted on 9th day. Previously treated for rheumatism. Quinine; turpentine enemata.

We shall offer no remarks on the foregoing; but merely add that we can hardly call the medicines administered in the recoveries "remedies;" they appear merely to have rendered the patient more able to fight against the battle of spasmodic action. Tetanus runs a certain course, it has its period of accession, its height and intense activity, and its gradual decline; it often kills before it reaches its active point; and often kills by exhaustion during its decline. Nothing seems to check its regular course; there is no control in its unvarying and undaunted career; it will have its sway. All we can do is to enable our patient to weather out the storm, by giving him as much strength as possible; and not adding fuel to the fire by all sorts of applications and internal remedies, which have over and over again signally failed. If we can help our patient on, one day after another, we gain much; constant watching and constant attention are required, both by night as well as by day, and an unflinching perseverance on the part of the sufferer; avoiding all causes of excitement, and more especially the cold air or winds; an uniform temperature being indispensable.

J. Hunter makes the following terse observations:

"All the antispasmodics have been given, but without apparent success; opium has kept its ground the longest, but with little reason, as it only quiets; but from some patients having got well under its use, its name has been raised; I have tried it, both in large and small doses, though always unsuccessfully. I think medicines have no power without they produce some visible effect. Opium never removes the cause, though it will prevent the effects; it cures spasms and removes pain, but it does not remove the cause. It often does good, by not allowing the symptoms to do harm to the constitution. The first appearance of a cure is a recovery of strength, as weakness is a predisposing cause; and the first indication should be to strengthen the system. I know of no internal medicine."

Again, he remarks, when treating of constitutional diseases from local irritation : "As those diseases which I have brought into this class, are of such various kinds, each must be taken up apart, and treated accordingly ; but they are such as yield very little to medicine, for in some the constitutional disease is formed, and does not require the presence of the local disease to keep it up, as in the tetanus ; and in others, the local disease being full in force, it is not to be expected that the constitutional affection is to be entirely relieved, although in some degree it may. In those which form a regular constitutional disease, such as an ague, although the local diseases may still exist in full force, yet some relief may be expected ; the bark is to be administered, although not with a view to cure, as the immediate cause still exists ; but bark will in some lessen that susceptibility in the constitution, and may cure at least for a time, as I have seen in agues arising from fistula in perineo."

Travers observes :

"Now the treatment of tetanus admits of the employment of two classes of remedies, relaxants and tonics. They are in no degree incompatible, but common sense would lead us to endeavour first to calm a wrong action, and having succeeded in calming it, then to apply our tonic for the restitution and preservation of the right one. Perhaps the tonic may be the calming power we ought to employ, in a case so rapidly destructive to life as the really acute tetanus, but our limited experience does not warrant the conclusion."

In conclusion, we have only to express a hope that we have not occupied too many pages in the dry detail of statistics. The communication must be looked upon as a mere hospital report, assisted by material from other sources. It is not an essay, but a 'Report on Tetanus' as observed in Guy's Hospital. Space has not allowed us to enter into any fuller discussion on the several important points, so that it must be left to our readers to make their own deductions from the facts collected.

ON

PURPURA,

AND ITS

CONNECTION WITH SPLENIC DISEASE.

By S. O. HABERSHON, M.D.

Purpura consists in the effusion of blood or of its colouring matter into the skin; constituting circumscribed spots or ecchymoses. Willan and Bateman distinguished several varieties as *purpura simplex, hæmorrhagica, urticans, senilis,* and *petechialis* or *contagiosa.* The first four are possibly varied degrees of the same state; the latter a symptom and consequent upon typhus or typhoid fever.

Purpura is generally preceded by feelings of languor and lassitude, small bright spots manifest themselves on the lower extremities about the ancles and knees; those joints at the same time often become somewhat painful or œdematous; similar spots then appear on the upper extremities and on the body generally; the bowels may be regular, the tongue clean, but the latter is generally found to be furred, the pulse mostly feeble and compressible; such a state is described as *purpura simplex.* After a few days of rest, &c., the purpura subsides, but is too frequently brought out when the erect posture and active employment are resumed. Repeated attacks of this kind may persist for weeks, months, or even years. If, however, the effusion assume the appearance of undefined bruises or ecchymoses, and is associated with discharge of blood from the mucous membranes, it is called *purpura hæmorrhagica,* and is a very serious and often quickly fatal disease. The discharge of blood is generally first observed from the gums, which have a spongy appearance, the thin bloody serum exuding close to the teeth—very different from the loose

spongy state of the gums in scurvy; epistaxis also takes place, and the mucous membrane of the alimentary, respiratory, and urino-genital passages pour out blood in varied proportions, sometimes even from the sides of the tongue; vomiting of dirty-coloured fluid takes place, partly from blood swallowed, and partly from direct effusion into that viscus. The evacuations from the bowels are often exceedingly offensive, and contain blood; if having passed from the stomach, black; if lower in the canal of a redder colour. Hæmoptysis may be very severe. The urine is observed to be of a smoky colour, from the presence of particles of blood, or is of a deep colour, from the same substance in larger quantity. The conjunctiva also becomes sometimes ecchymosed. From this loss of blood the patient is rendered exceedingly prostrate and pallid, the pulse weak, irregular, and failing; and death follows from syncope, as in Case II, or effusion of blood takes place into the brain, as in Case I, leading to symptoms of apoplexy, paralysis, coma, and death.

Some instances of purpura are preceded by a rash resembling urticaria. Such was seen in Case XI; and in Case X the symptoms were those of acute rheumatism, with erythema marginatum, the spots becoming purpurous, as the acute symptoms subsided. Such cases have been called *purpura urticans*.

Purpura senilis consists in smaller spots, in patients advanced in life, and is of an obstinate character. It is unnecessary to separate it from simple purpura. The purpura which occurs in fever is an indication of the impeded circulation, defective capillary changes, and depraved blood.

In reference to the pathological changes found in purpura, attention has naturally been directed to the condition of the blood. As regards its microscopical appearance, the blood in Case I did not present any remarkable deviation from health; that discharged from the mouth was examined; and after death that taken from the vessels of the abdominal viscera; the blood in the heart was found fluid and uncoagulated. Analyses of the blood in scurvy show a diminution of the red corpuscles; in purpura, on the contrary, if we are guided by the researches of Simon,[1] the amount of fibrin is considerably below the

[1] Simon's 'Animal Chemistry,' by Day.

normal standard. Some, however, have described the fibrin as increased.

Respecting other pathological conditions, in the fatal cases recorded, blood has been found effused into the substance of all the mucous membranes; of the mouth, œsophagus, stomach, and the whole of the intestine; beneath the serous membranes of the pericardium, pleura, and peritoneum; into the mucous membrane of the pelvis of the kidney, ureter, and bladder. In the brain, not only beneath the arachnoid into the meshes of the pia mater, but, as in Case I and V, into the cerebral substance, leading to apoplexy. Again, we find blood effused into the muscles and into the skin. The heart is generally flabby; the lungs present local patches of effused blood. The liver has been observed to be pale and flabby; the kidneys healthy, or in various states of degeneration, apparently complicative of the purpurous state. It is to the spleen that attention was drawn in both the cases here recorded, the only structure presenting evidence of disease which could not be looked upon as the effect rather than the cause. Dr. Copland describes the spleen as sometimes enlarged and softened, but here the appearance was remarkable; the enlarged gland was of a dull red colour, and studded throughout with pale yellow spots, from one to three lines in diameter; they were connected with the capillary circulation, and consisted of cells, nuclei, and granules. It is doubtless correct to consider them Malpighian corpuscles; and, as far as these observations point, they tend to show that this diseased condition of the spleen is a cause of purpura hemorrhagica. The researches of Mr. Gray on the 'Structure of the Spleen,' and those of Dr. Hughes Bennett in the 'Connection of the Spleen with Leucocythemia,' also confirm the connection of this part of the gland structures with the formative changes of the blood. In the case under my own care the white corpuscles of the blood were not in excess, perhaps the reverse; the disease observed in the spleen may have been the cause of imperfect elaboration of the fibrinous element of the blood. In several fatal cases recorded by Plumbe, the spleen is stated to have been healthy, but they were associated with other fatal diseases, as smallpox, tubercular disease, chronic pneumonia, and diphtheritic inflammation of the mouth. In a case of fatal apoplexy in a child, recently under Dr. Gull's

care with disease of the aortic valves, aneurism, &c., the spleen presented a similar appearance; it is doubtful whether this state of the spleen had any connection with the fatal effusion of blood or whether it was merely a condition of functional activity.

The occurrence of purpura with ague, and the tendency to hæmorrhage in that disease, strengthen the idea of a splenic origin of the complaint. So also its occasional presence with disease of the kidney does not militate against this idea, for in a case (No. v) under my care, of advanced degeneration of the kidney, in which hæmorrhage took place from the gums, &c., the spleen was found in a similar condition. Some forms of purpura, however, should rather be considered as simply of a congestive character; thus, in disease of the heart, whilst the liver and spleen are both engorged, and the healthy function interfered with, we find mechanical obstruction leading to great venous engorgement; the minute capillaries become over distended and at last ruptured, so that spots of purpura, and even blebs filled with serum and blood, are occasionally the result. Small spots of purpura are frequently associated with cirrhosis; and it is doubtful whether this is not the result of the hepatic disease alone, or whether of associate splenic disturbance; probably the former. In cirrhosis, epistaxis is a not unfrequent symptom; and in this disease, as in simple jaundice, it is very unwise to apply leeches or cupping glasses without extreme caution, for the difficulty of stopping the bleeding is notorious, and has sometimes nearly led to a fatal termination.

In some instances of purpura urticans it would seem that a state of active hyperæmia in the part precedes the effusion of the colouring matter of the blood. (Case x, xi, xii.) This form of the disease we would regard as essentially different from that found in purpura simplex or hemorrhagica, or even from that of a mere congestive character, but to be more closely allied to urticaria and erythema. In the 'Guy's Reports' for 1852, Dr. Gull, in showing the effects of electricity, pointed out the irritation produced by sparks taken from the back of a child; a red inflammatory blush was produced, with small white spots resembling urticaria; afterwards small purple spots were formed at the same situation, the irri-

tation gradually subsiding; the local changes thus produced were apparently very similar to those observed in some cases of purpura urticans, local stasis of the blood being followed by slight purple discoloration.

We regard purpura as consisting essentially in an abnormal condition of the blood, but the nutritive changes in the extreme capillaries and the state of those minute vessels, are also probably changed; it does not require any rupture of minute vessels to allow the colouring matter of the blood—hæmatin with serum—to exude; but such is the condition of the vessels in purpura hæmorrhagica, that the least pressure in any part, either of the skin or mucous membrane, suffices to tear vessels and lead to petechiæ or ecchymoses.

We would divide purpura into—

1, 2. The *simple and hæmorrhagic forms* arising from disease of the spleen or liver.

3. The *purpura erythematica,* and *urticans,* more allied to the exanthems, and the result of acute hyperæmic condition of the skin.

4. The *congestive* variety, as we find in disease of the heart, from extreme congestion of the capillaries; the blood doubtless modified by the engorged viscera. So also in advanced life, the capillaries themselves being degenerated.

5. The *petechial* form in typhoid and typhus fevers. In each, however, the character of the circulating fluid modified as we have before stated.

Causes.—Poverty and deficiency of vegetable food appear in some instances to be the cause of purpura, yet in some of the cases I have recorded the patients were in the habit of taking freely of vegetables; and this has been freely remarked as indicating a difference from scurvy. Salt provisions in excess tend to its production; so also intemperance, as in Case xi. Great mental depression and nervous agitation or fright, may cause it. Again, miasmatic influence and disease of the kidney act as predisposing, if not exciting causes of the disease; still more, degenerative changes in the liver and spleen.

It has been stated that it is more frequent in women than in men, but in the cases recorded in this paper, the majority

were men. Again, that the disease occurs more in the summer and autumnal months; each part of the year is found to have presented instances of it. Patients of a phthisical habit are apparently more liable to purpura.

Treatment.—Where the patient has been in indigent circumstances, and deprived of that which is so essential to the maintenance of health, fruit or vegetable diet, it is evident that this must be supplied, and is generally well associated with generous animal diet, and with malt liquor.

In simple purpura I have found great benefit from the use of arsenic in small doses. Hunt[1] describes the value of this remedy; and in several instances in which I have used it, I can confirm the favorable opinion he expresses. Where the secretions are disordered, which is frequently the case, as indicated by a furred tongue, offensive evacuations, it is well to administer alterative and purgative remedies. In some, as in Case VIII, steel was more serviceable than arsenic.

In purpura hæmorrhagica, a rapidly fatal result sometimes ensues. In my own case, purgatives of magnesia with mineral acids were of no effect. Many writers have strongly recommended their use. Heberden, Willan,[2] Plumbe,[3] Harty,[4] and others. Some have found turpentine of service, and Dr. Copland speaks very strongly of its value. Others, again, have used chlorate of potash, or tincture of iron and lemon juice, with benefit. Dr. Hughes relieved several by the administration of rum-punch. Hunt recommends the use of emetics, but it will be found that where hæmorrhage occurs from the gums, tongue, nares, retching takes place, and the vomiting which thus occurs aggravates the effusion of blood. I have never observed any instance of purpura where bleeding appeared in the least advisable, and we are led to suppose that in those instances where it was beneficial, very different symptoms must have been present than in the cases we have recorded. Purpura simplex and purpura hæmorrhagica probably arise from different degrees of the same state, but

[1] Hunt 'On Some Incurable Forms of Skin Disease.'
[2] Willan 'On Skin Disease.'
[3] Plumbe, 'Practical Treatise on Diseases of the Skin.'
[4] Harty, in 'Edinburgh Medical and Surgical Journal.'

whilst the former in most cases may be relieved by treatment, and is free from danger even when chronic and of a very obstinate character, the latter, in some instances, very quickly, and in spite of all treatment, tends to a fatal termination. Quinine freely with steel, and generous diet, is perhaps generally the treatment most serviceable.

Purpura hæmorrhagica.

Case I. William G., æt. 34, residing at Old Kent Road; admitted June; poor living.

„ II. Edward M'C., æt. 34, residing at Union Street, Borough; admitted February; poor living.

„ III. Infant, æt. 3 days, residing at Borough; poverty of mother.

„ IV. George T., æt. 8 years, residing at Deptford; admitted July; scarlet fever; albuminuria.

„ V. Ralph O., æt. 23, residing at Kent Street, Borough; admitted June; albuminuria.

Purpura simplex.

„ VI. Edward W., æt. 36, residing at Bermondsey; admitted October; incipient phthisis.

„ VII. William T., æt. 44, residing at Woolwich; admitted January; poor diet.

„ VIII. William N., æt. 31, residing at Limehouse; admitted November.

„ IX. Henry E. D., æt. 32, residing at Blackheath; admitted May; good diet.

Purpura erythematica—urticans.

„ X. Richard R., æt. 21, residing at Clerkenwell; admitted May; rheumatism.

„ XI. Caroline B., æt. 32, residing at Holborn; admitted October; intemperance.

„ XII. John T. B., æt. 20, residing at St. Luke's; admitted November; poverty.

Purpura, Scurvy?

„ XIII. George B., æt. 33, residing at St. Alban's; admitted October; salt provisions.

„ XIV. Mary B., æt. 8, residing at Hatcham; admitted May; starvation.

CASE I.—PURPURA HÆMORRHAGICA.—*Fatal; enlarged Malpighian bodies of the spleen.*

William G—, æt. 34, a rope-maker, residing in the Old Kent-road, admitted under my care June 1st, 1854. He stated that he had never been ill, and that he felt well till three days before admission, when purpurous spots made their appearance on his ankles, but afterwards became general. They were not preceded by any particular symptom. He was a married man, and his habits of life had been regular and temperate; his diet had been a mixed one, beef and mutton, and he had not restricted himself in the use of vegetables. The gums became very sore and tender, and began to bleed, but epistaxis did not come on for several days. The bowels were regularly acted upon. On admission there were numerous spots of purpura on the body; the motions were dark and extremely fetid; the urine contained neither blood nor albumen. The gums were slightly spongy and bleeding. The pulse small and feeble. The pupils rather dilated. Sulphate of magnesia, dilute sulphuric acid and infusion of roses, were given every four hours; meat, diet, and greens. June 3d, the epistaxis had ceased, but the gums continued to bleed. On examining the blood microscopically, there was no increase of the number of white corpuscles; the red were crenate probably from saliva. 4th, Decoction of bark with chlorate of potash were given. 5th, The epistaxis returned. 6th, There was pain in the left hypochondrium; no relief to other symptoms. Ordered: Tincture of iron, ♏xv, with lemon-juice, ℥j, every four hours. 8th, He was much worse, the hæmorrhage from the nose and mouth had increased. He was insensible and comatose. The pulse was slow, small, and feeble. He had passed a considerable quantity of blood from the rectum and from the bladder. The pupil of the left eye was much dilated, the right much contracted, the eyelid only partially closed. The right side was hemiplegic, with loss of motion and sensation, and the temperature was lower than the other; tickling the left foot produced excito-motory movement, not so the right. The paralysis had come on the same morning at ten, and was preceded by severe pain in the head. The coma continued till death, on the afternoon of

the same day, and death appeared to be immediately caused by the passage of blood into the larynx, and the obstruction about the epiglottis.

Inspection was made twenty-one hours after death. On the right conjunctiva there was ecchymosis, and the left side of the mouth was fallen. The whole of the body was thickly studded with spots of purpura, there was blood on the gums and at the nostrils. *Head:* There were spots of ecchymosis on the scalp, and the dura mater was thickly studded with points of effused blood. The arachnoid was dry, and the convolutions much compressed. Blood was effused into the meshes of the pia mater; and on the left side corresponded to the temporal bone. The fluid in the ventricles was slightly tinged with blood, more so on the left than on the right side. The left posterior cornu contained blood, and between this portion of the ventricle and the external surface was an irregular clot of blood, and numerous points of ecchymosis; the surrounding brain-substance was soft and diffluent. *Chest:* The mucous membrane of the œsophagus, as high as the clavicle, was infiltrated with blood. The trachea presented points of ecchymosis, so also the bronchi. The lungs did not collapse, they were congested, and contained spots resembling pulmonary apoplexy. The pleura had in it a small quantity of bloody serum, and the costal pleura was spotted with bloody points; there was a small quantity of bloody serum in the pericardium; the heart had numerous points of ecchymosis on the anterior surface of the right and the posterior surface of the left ventricle. The heart was flaccid, but its muscular fibre and valves were healthy; its cavities contained fluid blood; its weight nine ounces. *Abdomen:* In the rectus abdominis there was some blood effused. The peritoneum was healthy; but portions of both small and large intestine were distended with dark-coloured bloody fluid. The mucous membrane of the stomach, duodenum, jejunum, and ileum, were throughout ecchymosed. The cæcum was in a similar condition; and blood was poured out into the substance of the mesentery. The liver was pale but healthy in form and structure, three pounds three ounces in weight. The *spleen* was pale, soft, of a dull red colour, and contained very numerous light-coloured masses, about the size

of peas, throughout the whole of its substance. These pea-shaped masses, on microscopical examination, were found to be connected with the splenic capillaries, a larger capillary vessel being observed to be connected with one side of the mass; and on the other were several smaller vessels, but it could not be ascertained whether these ramified over or passed through the structure. The rounded mass consisted of granules and cells; several of them were irregularly aggregated together so as to constitute the pea-shaped mass before mentioned; splenic cells were observed of various sizes generally about the size of white corpuscles of the blood, some contained a distinct nucleus, others granular matter. The supra-renal capsules were large and pale; the lumbar and other glands healthy, but the areolar tissue about the lumbar nerves was spotted with blood. The kidneys were enlarged, being eleven ounces in weight; the secreting portion was healthy, but a considerable quantity of blood was effused into the mucous membrane of the calyces and the pelvis of the kidney. The bladder contained bloody urine, and its mucous membrane was ecchymosed.

Remarks.—The disease here was of a very acute character; a mechanic in the enjoyment of apparently good health, had effusion of blood into the skin, without any known premonitory symptoms; and in a few days the blood began to exude from the mucous membranes, and on the eleventh day led to a fatal termination. Every mucous membrane was affected, and the effusion of blood into the substance of the brain produced symptoms of apoplexy and fatal coma. There was nothing noticeable in reference to the diet, or in the state of the nervous system to lead to the disease; but it may be doubted whether the Old Kent Road is altogether free from miasmatic influence; probably no part of the Borough of Southwark is entirely free from this cause of disease.

The spleen was the only organ which presented any morbid appearance otherwise than those produced by the mere effusion of blood. The Malpighian bodies, for so we considered the pea-shaped masses in the spleen, were enormously enlarged; and this splenic disease we regard as intimately associated with the fatal complaint; these masses were connected with

the circulation of the spleen, and consisted of splenic cells and granules. Kölliker has suggested that the function of the spleen is in close connection with the metamorphic condition of the elements of the blood, and such is received by many physiologists and pathologists. This case tends to confirm the idea not only that such is the function of the spleen, but that acute changes in the Malpighian bodies is one of the causes of purpura hæmorrhagica. We observe in lardaceous disease of the Malpighian bodies of the spleen general anæmia, and in ague, where the spleen is enlarged, we have a disposition to the effusion of blood from the capillary vessels.

It may be supposed that this remarkable condition of the spleen was the effect and not the cause of the morbid state of the blood. As to the actual condition of the blood, no difference from the healthy state could be detected in its microscopical appearance, and it was not chemically analysed; that found in the heart was uncoagulated, and it would appear that the fibrin was deficient or changed in character, and the red corpuscles or the hæmatin also depraved.

Were the capillary vessels also changed so as to allow of this free transudation? we can scarcely suppose that the blood itself could for several days have been so generally modified, without the capillaries also being changed; but of this we have no proof. The liver, kidneys, and the lymphatic glands generally were healthy.

In the remedial treatment nothing appeared to be of any avail in checking the hæmorrhagic tendency. Dilute sulphuric acid with magnesia was first used; afterwards, chlorate of potash and decoction of bark, and then lemon-juice with tincture of iron, but without any effect. Turpentine was not tried; in a case of epistaxis with enlarged spleen, in which I tried it, so much irritation of the stomach and throat was set up that the hæmorrhage was increased by it, and I did not anticipate any benefit from its employment in this case.

Case II.—Purpura hæmorrhagica.—*Fatal; enlarged Malpighian bodies in the spleen.*

Edward M'C—, æt. 32, a baker, residing in Union Street, Borough, was admitted into Guy's, February 28th, 1854, under

Dr. Barlow's care. Seven months before he had been in the hospital for bronchitis, and several of his family had died of phthisis. During the preceding winter he had been in very destitute circumstances, having a wife and child to provide for, and without employment; in consequence of this state he had meat and vegetables only twice during the week.

A few days before admission he fainted whilst walking across his room, and afterwards vomited a very large quantity of blood said to have been two gallons. He continued to vomit blood in less quantity during the remainder of the day and at night; and purple spots then made their appearance on the arms, and he began to pass blood with the urine. On the next day, he vomited several pints of blood, and the spots of purpura increased.

On admission there were purple spots and blotches over the whole body, but especially on the arms and legs; the gums were spongy and bleeding; there was effusion of blood into the conjunctiva of the left eye; he coughed up much frothy blood mixed with black coagula, and complained of nausea; the urine was loaded with blood, the voice husky and indistinct, respiration laboured, skin hot, pulse 112, and compressible; the respiratory sounds in the chest were obscured by crepitation and sibilant râles; he was ordered lemon-juice ℥j, with tincture of iron ♏xx, every four hours; ice, lemonade, beef-tea, &c., *March* 1st, he was restless, the respiration more hurried; and he died on the following afternoon, apparently from syncope. He remained sensible till the last.

Inspection was made twelve hours after death. He was a well-made man, the extremities rigid; the whole body marked with spots of purpura; and blood was effused into the conjunctiva. There was effusion of blood into the scalp; but with the exception of slight increase in sub-arachnoid fluid, the whole brain was healthy. The cellular tissue around the trachea and œsophagus was filled with blood; the mucous membrane of the trachea was raised by similar ecchymosis, and appeared to be covered by a delicate diphtheritic layer. There was adhesion of the pleura on the left side and specks of blood were observed beneath it. The lungs did not collapse, and several lobules were filled with blood. The pericardium presented numerous points of ecchymosis. The right side of the heart

was flaccid, and contained only a small quantity of fluid blood; the left side was empty and contracted; and there was slight atheromatous deposit. In the abdomen there were numerous patches of ecchymosis beneath the serous membrane of the omentum and mesentery. In the stomach the whole mucous membrane was dotted over with ecchymosed spots. The duodenum and small intestines generally were healthy. The colon was filled with deep green fæces, and beneath the mucous membrane was almost general ecchymosis. The liver was large and pale, the weight four pound nine ounces. The structure contained a small amount of fat, normal secreting cells, and cell-nuclei. The gall-bladder contained about an ounce of thick dark bile. The *spleen* was seven ounces in weight, normal in size, congested, rather soft. The section presented very numerous opaque white points about the size of pins' heads $\frac{1}{8}$ to $\frac{1}{10}$ of an inch in diameter. These consisted of an immense number of cells, the splenic cells, with nuclei about the size of blood-corpuscles, others smaller, some merely highly refracting granules. The structure of the supra-renal capsule appeared more uniform than usual. The kidneys were large, their weight eighteen ounces; the surface smooth and presenting points of ecchymosis, the secreting structure pale. The pelvis of the kidney contained a small quantity of effused blood; but beneath the whole mucous membrane blood was effused rendering the membrane nearly $\frac{1}{16}$th of an inch in thickness. The uriniferous tubes were dilated and filled with cells. In the bladder were a few points of ecchymosis. The blood from the spleen was found to contain but few white corpuscles, and the red appeared to change form easily. From the hepatic vein the blood contained more white corpuscles.

This case is very similar to the preceding one; but the immediate cause of death arose from syncope, and not from apoplectic effusion of blood into the brain. The spleen also was in a similar condition; the Malpighian corpuscles were enlarged, but to a less degree. The man had been in destitute circumstances, but the purpura was comparatively sudden in its attack, and in about six days terminated fatally.

Case III.—Purpura hæmorrhagica *in an Infant.*

——, brought her infant, æt. 6 weeks, among my out-patients at Guy's, and stated that three days after its birth she noticed several bruises about its body, that there was ecchymosis of the eye, and that as these ecchymoses disappeared, others came. When the infant came under my care, there was a large swelling on the side of the head, at the posterior part of the parietal bone, evidently consisting of blood effused under or into the scalp; on the shoulder was an ecchymosis about an inch in breadth resembling a bruise. The infant was very poorly nourished, and the mother had been in distressed circumstances during her pregnancy.

Steel and quinine were given to the mother, and a little chlorate of potash to the infant. As the former recovered her health, under improved diet, her milk became of a more nourishing character, and the child slowly but completely recovered. The condition of the infant when first presented almost precluded the hope of its survival.

This case was one of great interest, not only on account of its cause—the imperfect supply of proper nourishment even before birth; but in a medico-legal aspect; that such ecchymoses and effusions might, if the infant had been found dead, have been attributed to improper treatment or infanticide.

Case IV.—Purpura hæmorrhagica.—*Albuminuria after scarlet fever.*

George T—, æt. 8, was admitted into Guy's, under my care, July 18th, 1856. He was the child of a policeman, had had scarlet fever a month before, and on admission was exceedingly pale, with slight general anasarca, and the urine very albuminous. He was clothed in flannel; purgatives and acetate of ammonia, beef-tea and arrow-root, and afterwards steel medicine, and a small quantity of wine, were given. He had improved much in health; but on August 29th, severe purpura hæmorrhagica came on. There was bleeding from the gums; the urine contained blood, so also the motions; the legs presented numerous spots of ecchymosis, and the child became

very prostrate. He was ordered chlorate of potash, grs. x; lemon-juice, ʒij; decoction of bark, ʒvj, three times daily. To have greens with meat diet.

Under this treatment he rapidly improved; but still was exceedingly pale, the blood and albumen disappeared from the urine; the blood from the motions, and the gums became natural, and the ecchymosis disappeared.

On September 8th, the skin became pungently hot and dry, the tongue slightly furred, and some spots of purpura remained. There was no cough or evidence of pneumonia. There was no albumen in the urine. The pulse was 160, the respiration 24.

Chlorate of potash, grs. vij, with julep of hydrochloric acid was given, and the greens and meat continued, the wine to be omitted.

11th.—The heat of skin disappeared, the child much improved, but still very anæmiated. In this condition he was removed by the parents.

This child was exceedingly ill on its admission into the hospital, but appeared to do well; the albuminuria ceased; the anæmia, however, remained; severe purpura hæmorrhagica then came on, and a fatal result was dreaded; this happily was averted. As to the cause of the purpura in this case, there was evidence of great deficiency in the red corpuscles of the blood, and, perhaps, a vegetable diet was too long withheld. There appeared to be every probability that if the child were removed to a healthy locality, and properly nourished, recovery would be complete.

CASE V.—PURPURA HÆMORRHAGICA.—*Diseased spleen; small, white, granular kidneys; capillary apoplexy of the cerebellum; hypertrophy of the heart.*

Joseph O—, æt. 23, was admitted under my care into Guy's, June 28th, 1855, and died on the 30th. He was pale and anæmiated, a man of dissolute habits, who had employed himself as a news-agent, and had resided in Kent Street, Borough. For three months he had had epistaxis, and for about one week before admission he had had a boil on the

sacrum, from which a discharge of thin serum took place in considerable quantity. On the day of admission he had discharge of blood from the nose, and from the margins of the gums; the pulse was sharp and jerking, the voice hoarse, the respiration accompanied with a loud stridulous noise; at the base of the right lung there were mucous râles; the conjunctiva was watery, and the urine albuminous. Steel and quinine were administered. On the 30th, the brain became oppressed, and the patient gradually became comatose; a blister was applied to the neck, and a turpentine enema administered. In a few hours death took place.

Inspection.—The body was pale, but there was no œdema. *Brain:* The subarachnoid fluid was increased; at the lower surface of the right lobe of the cerebellum there was a patch of ecchymosis; and the section showed that minute points of blood were extravasated throughout the convolutions in the course of the pia mater, covering a space about an inch in diameter, there were also some points of ecchymosis in the white substance. In the mouth were clots of blood. The larynx contained bloody mucus, but was not œdematous. There was a small quantity of bloody serum in each pleura. The bronchi were full of tenacious mucus. The lungs were very œdematous, slightly compressed, and readily lacerable. *Heart:* In the right cavities, was firm decolorized clot, in the left small loose clots; there was considerable fatty degeneration of the muscular fibre of the heart, as shown in the wavy mottling of the inner aspect, and on microscopical examination; the left ventricle was dilated and hypertrophied, the weight of the heart fifteen ounces. The stomach and intestines were healthy. The liver was healthy; the gall-bladder full; the *spleen* four and a-half ounces in weight, but the Malpighian bodies were large, pale, and appeared to form a considerable portion of the gland, &c. The kidneys were pale, granular, extremely degenerated; the tubes wasted and full of granules.

In this case there was ample cause for a degenerated condition of the blood from the previous dissolute habits, and the advanced degeneration of the kidneys. Many cases of albuminuria are, however, entirely free from the tendency here

manifested to the extravasation of blood; the spots of purpura were observed on the skin, but there was severe and repeated epistaxis; the boil on the back led to constant thin, serous and blood-stained discharge, and in the brain there was capillary apoplexy. The fatty state of the heart increased the feebleness of the circulation, and was an indication of the state of nutrition in general; but this is often met with without any tendency to effusion of blood. The condition of the spleen was somewhat similar to that observed in the two fatal cases of purpura hæmorrhagica first recorded, the Malpighian bodies enlarged, and constituting a large part of the gland. It is probable that this state had so modified the already existing disease as to lead to the increased alteration in the state of the blood, and the disposition to the transfusion of blood from the capillaries generally. Quinine with steel, and a generous diet, appeared most probable means of checking these degenerative changes. Capillary apoplexy, however, led to a quickly fatal termination.

Case vi.—Incipient phthisis. Purpura.

Edward W—, æt. 36, a carrier, residing in Bermondsey, was admitted under my care, October 10th, 1856. Three months previously, the ankles became swollen and painful, afterwards an irritating cough came on with pain, and he became weaker; six weeks before admission he had slight hæmoptysis. He was a tall man, but anæmiated. The respiration was hurried, 29 per min.; he had cough with slight expectoration of blood; at the left apex there was dulness and prolonged expiratory murmur. On both legs there were spots of purpura, and there was slight œdema; the urine was healthy. He had lived well.

Cod-liver oil, ʒij, was ordered three times a day; and dilute hydrochloric acid, ♏x, compound tincture of camphor, ♏xx, infusion of calumba; with meat diet and greens. On 27th, the purpura still continued, but he had improved in health. Solution of arsenite of potash, ♏iij, were given in decoction of sarsaparilla. In a day or two spots of purpura had disappeared, the man felt much stronger, and left the hospital, November 3d.

I have observed several instances in which with early phthisis, purpura has manifested itself; in some, quinine and steel have been sufficient to remove the symptoms; in others, the plan adopted here of giving minute doses of arsenic was more beneficial; aching pain in the lower extremities was the prominent complaint in these cases.

Case vii.—Purpura.

William T—, æt. 44, admitted into Guy's, under my care, January 30th. He was a policeman, who had resided at Woolwich; an anæmiated man, who had been much exposed to cold and wet; he had been accustomed to take only a small quantity of meat, and very little vegetable food; his principal diet had been bread and rice. Seven weeks before admission he took cold, and experienced, a short time afterwards, weakness in his legs and ankles; several spots of purpura then appeared, and rapidly increased in number, other spots were found on the arms, but more about the ankles. The heart was normal, the stools dark in colour, the urine did not contain blood. There was no sponginess of the gums. He was stout, but feeble.

Full diet and greens were ordered, and the compound steel mixture. The spots quickly disappeared, but returned after a short time when he walked about. His health improved much; quinine was given, and with a similar effect; the purpura returned on his making exertion; solution of arsenite of potash was then given, and with better effect, the purpura very quickly disappeared, and that more permanently. The same diet had been continued throughout. He returned to his employment, but in a few months again appeared as an out-patient; quinine was repeated, but afforded only partial benefit; the relief obtained by the solution of arsenic was equal to that whilst he was an in-patient, and in a few days he felt well.

Insufficient nourishment, especially of vegetable diet, and residence in a miasmatic district, were the probable causes of the purpura in this instance; the spleen could not be felt below the ribs, nor have we evidence that it was diseased,

further than from the known effects of residence in miasmatic districts. In the treatment, the beneficial result was in part due to the generous diet; with this steel was at first given, and afterwards quinine, but only with temporary relief; the solution of arsenic produced cessation of purpura almost at once. Arsenic has long been used as a medicine in scaly diseases of the skin, lepra, psoriasis, &c.; and Hunt recommended its use in purpura. In cases of poisoning by arsenic, considerable irritation has not unfrequently been observed; it appears to stimulate the cutaneous capillaries, or the peripheral nerves upon them. In a fatal case of poisoning by arsenic, which I observed some years ago in the wards at Guy's, not only was there considerable irritation of the conjunctiva, but the patient stated in the semi-delirious state which occurred twenty-four hours before death, that the other patients in the ward had all night been running pins into his skin; a complaint which tended to show that he experienced considerable irritation of the cutaneous nerves or their cerebro-spinal centres.

Case viii.—Purpura.

W. N—, æt. 31, married man, a pork-butcher, admitted November 4th, 1856, under Dr. Barlow's care. He was a tall well built man, but he was anæmiated. He had resided at Limehouse. Two weeks before admission he became overheated, and was exposed to cold; the lower extremities were chilled, and he soon afterwards had pain in the knee, with heat and swelling. On the following day purple spots appeared on the left knee, and extended to the foot and to the nates; as the purpura increased the pain in the knee diminished; on the following week the right leg was similarly affected. He had been accustomed to take much salt meat, and but little vegetable diet. On admission there were numerous small purple spots on the lower extremities, some were bright in colour, others dusky brown; pressure on the thighs and legs produced pain; he complained of weakness and of a sense of faintness, and that walking gave him much pain; the tongue was slightly furred; there was no sponginess of the gums; nor was there any blood in the evacuations; the urine was healthy; the thoracic viscera were normal.

He was ordered Hydr. c. Creta, gr. ij; Extr. Hyosc., gr. v, every night; and in a few days lemon-juice with decoction of bark; afterwards, sulphate of zinc and copper, with opium, were given; the improvement, however, was slight. On December 8th, there was pain in the limbs; the purpura existed as on admission, and the patient was scarcely able to stand. Liquor Potassæ Arsenitis, ℥iij, with sarsaparilla, was given three times a day. On the 11th, the purpurous spots were more abundant; the arsenic was increased to ℥v, and chop with potatoes, and wine, ℥iv, prescribed. On the 15th, the arsenic was reduced, because the stomach was disordered; there was loss of appetite, and a slight red line along the gums. On the 18th, he was more comfortable, the spots had almost disappeared, and the pulse was firmer. On the 27th, the purpura reappeared as severe as at first, after the patient had sat up; he was, however, better in health, and was less anæmiated. On the 31st, the ammonio-tartrate of iron was given, and with manifest benefit; it was continued for a month; the anæmia became less, the strength increased, and the purpura disappeared.

In this, as in a previous case, the patient had been in the habit of taking freely of salt provisions, and sparely of vegetable diet; the man was anæmiated, but was free from any sponginess of the gums. Steel and fresh vegetables slowly restored him to health. Many instances of purpura occur in which there is no absence of fresh vegetable food, and in which it would seem that the capillary vessels yield on the slightest pressure, so that any irritation is followed by ecchymosis or the discharge of blood; the coat of the vessels appear to have lost their vital tonicity and contractile power.

Case ix.—Purpura.

Henry E. D—, æt. 32, was admitted under Dr. Hughes's care, October, 1855. He was by trade a smith, married, and of temperate habits, and had resided at Blackheath. Three months before he had observed bright spots on his legs, and in a day or two afterwards some on the body; they slowly changed in colour; before the purpura appeared he had felt wearied and enfeebled, and suffered from slight palpitation of the heart,

with dyspnœa. He continued at his work for some time, but was obliged to desist because the ankles and legs swelled, and on account of pain in these parts and in the loins and shoulders. There was no bleeding from the gums or sponginess of them. He had a florid complexion; the spots of purpura were numerous on the thighs and legs, and slightly raised; the pulse was feeble; the tongue dry and furred; the bowels regular; the urine, scanty and high coloured, contained lithates, but no blood. He had been accustomed to take four pints of porter daily, with meat and vegetables in abundance. He was ordered rum with lemon-juice and sugar, and meat diet. The spots of purpura slowly subsided, but some ecchymoses again appeared. He left the hospital in about a fortnight in improved health.

In this instance the purpura appeared in a man who had abundance of vegetable and animal food, and was one of those cases which strongly indicate the difference between purpura and true scurvy.

Case x.—Erythema marginatum, *becoming Purpurous, with symptoms of Acute Rheumatism.*

Richard R—, æt. 21, was admitted under my care into Guy's, May 16th, 1855. He was a strongly built man, a carver and gilder by trade, living in Clerkenwell; but having been out of work he had not had his usual food, and had been much exposed to cold and wet. He stated that his habits of life had been sober and temperate, and he was never the subject of syphilis. Three years previously he had severe rheumatism, with an attack of erythema. Eight days before admission severe pain in the head, with weariness and lassitude came on, and on the following morning severe pain in all his joints, especially the small joints of the upper extremity, and accompanied with a rash on the arms, chest, and back.

On admission he was pale, his countenance anxious, the skin freely perspiring; his joints were swollen, red, and extremely painful on pressure. The rash had the following characters: On the chest, arms and legs, and slightly on the face, were raised red patches, the redness disappearing on pressure. The centre of some of these patches was pale; so also

was the intervening skin; their form was irregular, some oval, others crescentic. On the back the eruption had a purplish red colour, and the patches were more confluent. There was slight tingling about the skin, but no severe itching. His general symptoms were precisely those of rheumatic fever; the skin was covered with profuse perspiration of an acid reaction; the pulse 90, full and regular; the urine high coloured, sp. gr. 1025, acid, and containing an abundance of lithates.

During the four following days the eruption became more severe, the patches increasing in size at their circumference, but becoming paler in the centre; the paleness of the surrounding skin, as contrasted with the raised red blush, became more marked; the pain in the joints also continued, preventing sleep, &c. Severe pain came on in the intercostal muscles on both the right and left sides, about the seventh rib, and over the region of the heart; and a to-and-fro sound was audible, which continued for two days.

On the 21st, five days after admission, and twelve or thirteen from the commencement of the attack, the eruption became more pale on the face, chest, and arms; on the thighs the pale centres of the patches also became larger, and with this gradual subsidence of the eruption, the pains in the joints became less severe, and the general distress diminished.

22d.—At some parts, but especially the lower extremities, points of ecchymosis or purpura were observed at the parts previously affected.

28th.—The rash had nearly disappeared, and the patient pale and weak, only complained of slight stiffness in the limbs. He convalesced slowly, and left the hospital in less than a month. The treatment consisted of salines, carbonate and sulphate of magnesia with colchicum, and of acetate and nitrate of potash; afterwards of decoction of cinchona and soda. For several days he took calomel, antimony, and opium.

In erythema nodosum, severe aching pain in the lower extremities, which simulates the pain of rheumatism, is a very frequent symptom; the disease runs a definite course, and appears to arise from a morbid condition of the blood. This is pro-

bably the case, not only in the ordinary exanthems, but in roseola and urticaria; in the instance narrated it was doubtful whether the whole of the symptoms arose from one cause; whether, in fact, the disease was rheumatism at all, but rather some modification of the blood closely allied to the rheumatic state, but not identical. Cases are recorded of urticaria occurring with rheumatism, of roseola annulata with pericarditis,[1] and it is probable that each are modifications of the same condition. At the commencement the appearance of the cutaneous affection somewhat resembled urticaria, afterwards purpura; the general symptoms those of rheumatic fever.

A short time ago a young man, æt. 19, came under my care, with aching pain in the limbs, loss of strength, faintness and night sweats, with sharp pulse, and the gums were spongy. No visceral disease could be detected, and it appeared that a paucity of vegetable food was the cause of a state of incipient scurvy or purpura. Chlorate of potash, with lemon-juice and decoction of bark, and more suitable diet, restored his health. It is probable that many instances of supposed rheumatism have their origin in this cause.

Case xi.—Purpura urticans.

Caroline B—, æt. 32, a woman of depraved character, who had resided in Red Lion Street, Holborn, of very intemperate habits, and who had had two children before she attained the age of 16, was admitted into Guy's, under Dr. Hughes's care, October 11th. A fortnight previously, after exposure to cold and wet at the period of menstruation, a great number of purple spots appeared on the legs, thighs, arms, and on the body generally. She was a large coarse woman, evidently in a cachectic state; the face was bloated; there was no sponginess of the gums or bleeding from the mouth; the skin was moist; the pulse feeble; the tongue had a brown fur; the spots presented various stages, some more florid than others; the bowels were open regularly; the urine scanty, sp. gr. 1025. The thoracic viscera were apparently healthy. She had been

[1] Wilson 'On Cutaneous Disease;' Cazenave and Schedel, 'Maladies de la Peau.'

accustomed to take meat and vegetables daily. Before the purpura appeared she felt languid and much depressed. Chlorate of potash, gr. x; iodide of potassium, gr. iij, were given three times a day in decoction of bark; and meat diet with vegetables and stimulants. The iodide of potassium was displaced for hydrochloric acid, since there was no evidence of secondary syphilis. On the 23d, a few days after admission, the spots had almost disappeared, but on the 26th, they again manifested themselves, preceded by *nettle-rash;* the pulse was feeble, 76; tongue coated with pale brown fur; the urine contained lithates. Alum, gr. x; sulphate of iron, gr. iss; sulphate of magnesia, ℈j; and dilute sulphuric acid, ♏x, were given in water; vomiting and purging came on, but the purpura disappeared rapidly. In five days it returned, again preceded by urticaria. She was now ordered, rum, ℥iv; sugar, ʒvj; lemon-juice, ℥iij; water, ℥viij, every day. Under this treatment the rash soon disappeared, and she left the hospital.

We have no evidence, in this case, of diseased spleen, but in a woman of such intemperate and dissolute habits it is probable that the secretions of the liver were disordered; the mucous membranes and every gland-structure disturbed. There was evidence of this disturbed secretion in the furred tongue and in the general cachectic state of the patient. It is exceedingly common to find slight purpura with hepatic disease, and few cases of cirrhosis are free from it. Depression of mind and exposure in such a person might have increased the tendency to this disease. After admission the spots quickly disappeared, but as soon as the patient began to move about, returned; and in each attack that was observed, the eruption was preceded by urticaria. Under various treatment the purpura ceased;—first, chlorate of potash with hydrochloric acid; afterwards, alum and sulphate of iron; and, lastly, rum-punch appeared to be equally efficacious, or perhaps more correctly, inefficacious, for we have little doubt that the condition upon which the disease depended was not removed by any of these means, which were only of *temporary* service. It is more probable that perverted general nutrition and assimilation, perhaps from hepatic and splenic disease, were the cause of the purpura, and only remedial by a complete change in the diet and habits of the patient.

Case xii.—Purpura urticans.

John T. B—, æt. 20, was admitted into Guy's, under the care of Dr. Gull, November, 1854. He was a brassfounder, unmarried, and resident in St. Luke's; but at night he had engaged himself as an actor at theatres. His father had died of phthisis. He had been out of employment for three months, and had consequently been unable to obtain sufficient food, living chiefly on bread and butter, but no meat or vegebles. A week before admission, soon after rising in the morning, he noticed large blisters, about the size of a crown piece, on his left hand and arm; in a few hours these dried up and became of a deep purple colour, and when he became warm entirely died away; subsequently they came out on his right arm, afterwards on both legs and arms, but in each instance pursued a similar course. The knees and wrists became stiff and swollen. He was a man of anæmiated appearance; the tongue clean and moist, but pale; the pulse small and very feeble, 62; the skin cool; he complained of a sense of coldness down the back; the bowels were confined; the appetite good. He was ordered meat diet, and decoction of bark with nitric acid. The urine was healthy. After admission, the eruption as described appeared in the morning and evening, but disappeared when the patient became thoroughly warm. He improved in health, under the medicine before mentioned and the compound iron mixture, and left the hospital in about three weeks.

This case appeared to be very different from the others described; there was probably an erythematous condition, of a deep colour, rather than actual extravasation of blood into the substance of the skin, and it was possibly due to a state of transient stasis in the capillary vessels leading to the formation of blebs, but disappearing when the circulation became sufficiently active. It was doubtless increased, if not caused, by the impoverished diet, and the irregular habits of the patient. A good and well-regulated diet, with attention to other hygienic means, would be probably sufficient to relieve this condition, facilitated by preparations of quinine and of steel. The pain and swelling in some of the joints pointed to a state

similar in kind, though not in degree, with Case x of Erythema marginatum, with symptoms of acute rheumatism. The hereditary predisposition to phthisis possibly increased the disease. We often observe purpura with incipient phthisis, and this man had lost his father from that disease.

Case xiii.—Purpura—Scurvy ?

George B—, æt. 33, was admitted into Guy's, October, 1855. He was a muscular man, single, and resident at St. Alban's, a gamekeeper, and previously a gardener, who had drank freely, and had been accustomed to take a large quantity of salt, salt bacon, fish, and salt with bread, and very little vegetable food. For twelve years he had been subject to attacks of purpura, which sometimes ceased for one or two years. During three weeks before admission, he had suffered from vomiting; from a sense of weight at the scrobiculus cordis; he had lost strength, and had felt dull and faint; the vomited matters and the dejections were both dark in colour, evidently from blood. For several days he had kept his bed. On admission he had spots of purpura on the arms and legs; there was ecchymosis of the shins, and slight swelling in the popliteal spaces, axillæ, and groins; the gums were spongy and bleeding; but the urine did not contain blood. He was anæmiated in aspect, tall, but with considerable muscular power.

Lemon-juice and steel were prescribed, three times a day; Greens, with meat and porter, were also ordered. He had some vomiting after the medicine. The purpura was quickly relieved, but again returned; by persistence in the same remedies, his health much improved, and he left the hospital, but still not free from spots of purpura.

The great amount of salt which this patient had been in the habit of taking was probably the cause of the disease; it was more allied to ordinary sea-scurvy than the case of purpura hæmorrhagica previously detailed; and proper attention to diet, the use of fresh vegetables, and the diminution in the quantity of salt taken, would perhaps be sufficient to establish health. He had been in the habit of taking as much

as a teaspoonful of salt on bread and butter, and that repeatedly.

Case xiv.—Purpura—Scurvy.

Mary B—, æt. 8, a fair-complexioned and intelligent child, was admitted into Guy's, under Dr. Rees' care, in May. She had resided at Camberwell, and was in good health till three months previously, when, having been sent to school to Hatcham, she was starved, having as food flour and water, meat once a week, and very rarely vegetables. She soon, under this barbarous treatment, lost her appetite, experienced nausea, pain at the epigastrium, she became unable to walk, and had pain in the popliteal space, the legs and arms becoming studded with spots of purpura. In a fortnight from the appearance of these symptoms, the ankles and face became œdematous, and the right knee swollen and painful; there was no epistaxis or change in the gums. Nine days before admission there was discharge of blood from the bowels; and the evacuations also became white, clayey, and very offensive.

Lemon-juice, ℥j, with ♏x of tincture of iron were given, with full meat diet and potatoes; compound soda powder (Guy's) grs. viij, every night.

In a few days great pain in the region of the stomach came on, followed by severe vomiting, and the purpura disappeared. The gastric symptoms continued very severe for more than a fortnight, but gradually subsided, so that she became able to retain food, and slowly convalesced. She left the hospital comparatively well in about six weeks.

This case also was one more allied to scurvy, and evidently arose from poor diet, and absence of vegetables. The sudden administration of full diet, fresh vegetables, lemon-juice, set up great irritation of the stomach, if not actual gastritis; these symptoms yielded to mild saline treatment.

ANATOMICAL DESCRIPTION

OF A

DOUBLE FŒTUS.

By S. O. HABERSHON, M.D.

In the 'Guy's Reports,' of 1849, Mr. Poland has carefully described two double monsters; the following is a modification of the last form which he dissected. It was sent to the museum at Guy's by Dr. Lever, being presented to him by Mr. Crisp, of Walworth, during the period of my curatorship, and I shall limit myself to a description of it.

The monster consisted of two female fœtuses, about seven and a half months, of the character described as "Cyclopian," "janusbilding," "dehypogastricus," by Rokitansky, and by G. St. Hilaire as "synotus." There was a single head, one side having the ordinary appearance of eyes, nose, and mouth, and laterally having ears; but on the other side was a single eye, small flattened nose, rudimentary lips, and external ears situated low down, so that the pinna of each ear nearly met at the rudimentary mouth. The face of each fœtus was apparently only half developed, the well-developed face consisting of half of each united in the median line. The septum at the posterior part of the brain, the double mouth, pharynx, and trachea, militated somewhat against this idea, so also the arrangement of the vessels.

The brain was bounded laterally by large parietal bones, in front large frontal, but the temporal were small, and the petrous portion or sense part thrown much forward; the posterior part was covered by a bony plate, which was probably

the frontal. The occipital were situated laterally, and bounded two deep cerebral fossæ, from which on either side the medulla extended to the respective spinal canals; each of these fossæ were partially covered by a tendinous membrane or tentorium. At the posterior part of the brain was a membranous septum, which shut off a portion of brain-substance connected with the rudimentary senses of the posterior part; this posterior part did not communicate with either medulla, which were connected together, and with the better developed brain-substance. The brain-substance was semi-diffluent, but the corpus callosum was seen to be imperfect, the larger face received the optic third nerves in the usual manner, and to the posterior part the third, fifth, and sixth nerves were observed extending. The nerves from the medulla on each side passed outwards in the usual manner. In the centre of the brain between the medullæ and cerebella, on either side, the bone was imperfect, and a rounded mass of brain-substance filled the space, the optic nerves arose anteriorly, and to the single Cyclopian eye was a single optic nerve, which apparently extended to the central part of the base.

The neck was single, and contained a pharynx opening into two buccal cavities, the posterior one smaller, the tongue and lips being rudimentary; there were on either side a larynx, protected by an epiglottis, and a trachea connected with each; but between these respiratory passes was a single œsophagus. The rest of the body consisted of two ordinary trunks united by their anterior surfaces as low as the umbilicus; and having the usual extremities attached. The thorax internally was double, presenting the usual pleural cavities and pericardia closed and separate the one from the other. The peritoneal serous membrane, however, was single; there were, however, two umbilical veins and two sets of arteries, the one vein much smaller than the other. The viscera described as belonging to No. 1, were those of the more perfect facial and cerebral aspect. Heart 1—Pericardium entire, the direction of the heart normal, the apex towards the left. Right auricle received the vena cava from the liver below, above the superior cava formed by veins from the upper and lower extremities and from the head, the vein passing in the course of the aorta; the right auricle also received blood from the right lung, and communicated freely

with the left by means of an imperfect septum; the pulmonary artery was larger than the aorta, was furnished with three semilunar valves, gave a branch to the right lung, and was then continued onwards into the aorta, it gave an equally large vessel to the aorta of Heart II; the tricuspid valve was perfect.

Left auricle received blood from the left lung, and communicated freely with the right auricle; the left ventricle was as large as the right with which it was united by an opening at the upper part of the septum. There was a normal mitral, but only two semi-lunar valves at the commencement of the aorta. The aorta was smaller than the pulmonary artery, it gave a branch to the left lung, and then passed into the aorta. The true auricles were perfect.

Heart II—The apex was directed towards the right side, and on opening the pericardium and thorax, the vessel from its base was also found to be directed to the right side. Both auricles were situated on the left side of this heart, and were separated by an imperfect septum, there was an auricular appendage connected with each, directed upwards and downwards. The inferior auricle received the blood from the liver, the superior that from the head and neck, and upper extremities alone of this side; the vessels from the lungs opened into each, or at the part where the septum was imperfect. Right ventricle was much smaller than the left, but this ventricle appeared really to be the left, had not the heart been inverted or twisted; it received its blood only from the left ventricle, with which it freely communicated, the valve which protected the opening from the auricle into the common ventricle extended into the septum, and there was no other opening into the auricle; the vessel from the left ventricle was protected by two valves, and passed directly to the aorta. The left ventricle (or more correctly the right) was much larger, there was a large auriculo-ventricular opening and valve; at its upper part was a large vessel, protected by three semi-lunar valves, it passed onwards into the aorta, and on either side gave off the pulmonary arteries.

Aorta I—formed by both aorta and pulmonary arteries, arched over to the left side, but communicated directly from

its upper part by a vessel, of equal size with itself, with Aorta II. Four vessels were given off, the first subclavian and carotid arising together; the other carotid and subclavian apart. The aorta then arched downwards, and gáve off branches to the intestines, to a horse-shoe kidney, large Wolffian body, &c., and then divided into two iliacs; the external passing to the inferior extremities, the internal giving off small hypogastric arteries.

Aorta II—formed by both aortic and pulmonary arteries, turned to the right and received a large communicating branch equal to its own size from Aorta I, it gave off from its upper part two carotid and one subclavian artery, the other subclavian arising from the communicating branch. As it passed downwards it gave similar branches as the other aorta to the kidneys, separate on this side; to the intestines, Wolffian bodies; the internal and external iliacs, the former giving two hypogastrics.

The venæ cavæ were different on the two sides. Cava I passed with the aorta, receiving the renal and iliac veins, the carotid, subclavian and iliac vessels, and arched upwards with the aorta without passing through the liver, emptying itself into the right auricle.

Cava II received the iliac and renal vessels, and then passed into the liver of No. I, so that the blood from both sets of kidneys and four lower extremities reached the same heart. The venous blood to Heart II, came from the liver on the same side, and from the jugular and subclavian veins on that side. The umbilical veins extended to the liver on each side, but that to liver II was very small, the liver also much smaller.

The lungs were divided into the usual lobes, and were in separate serous cavities; the trachea and larynx on each side were distinct. The diaphragm was single.

Digestive organs.—The pharynx and œsophagus were single, and extended into a single stomach, of a crescentic form, convex below, and receiving the œsophagus in the centre of the concave upper margin. Opposite to the œsophageal opening was the pylorus and the commencement of the duodenum. On either side of the stomach was a small spleen; the

mucous membrane formed large rugæ, transverse in either lateral sac, but straight as it reached the duodenum. The duodenum itself was straight, and was situated in the median line. On either side it received a double set of ducts, biliary and pancreatic; it then extended to the small intestines; the ileum terminated in the cæcum, in the usual manner; the appendix and colon, sigmoid flexure and rectum, were normally constituted; a short distance from the cæcum was a small diverticulum; the small, and especially the large intestine were distended with green coloured fluid—Meconium. The small intestine in No. II was imperfect; the duodenum and jejunum were absent; the ileum commenced in a rounded cæcal manner, free in the abdomen; a short distance before it reached the cæcum, was a diverticulum; and the cæcum, colon, and rectum, were then normally constituted, but nearly empty, they did not contain meconium.

The kidneys of No. I were horse-shoe, the ureters passed into the bladder, which was normally developed, but the apex somewhat conical. The kidneys of No. II were double; on both sides there very large Wolffian bodies.

Liver I was much larger than the other; it received the ordinary hepatic artery and porta, large umbilical vein; the cava from its own side passed with the aorta, and opened into the upper part of the right auricle of Heart I, but Liver I also received the inferior cava of the No. II fœtus, which was formed by its iliac and renal vessels, &c. Liver II also had hepatic and portal vessels, and a small umbilical vein, but it was a smaller gland. Each liver had gall-bladders, but the ducts opened into the single straight duodenum.

The genital organs were both female and normally constituted.

In this monster two germs appeared to be incorporated and unequally developed. In the brain, the origin of the medulla oblongata gave the idea of two brain-centres united, and the anterior parts turned aside, but the posterior septum did not confirm such a supposition. One heart received a larger supply of blood than the other, and was more perfectly formed.

There was a greater trace of the remnants of bronchial arches in the origin of one of the pulmonary branches from the aorta, than we find in the ordinary fœtal development. The aorta gave branches to both sides of the well-developed face and head. The circulation was much involved, of mixed character, as in reptilia, and it appeared very doubtful whether it could have been carried on after the commencement of aerial respiration. In the abdomen, the viscera were more incorporated, as the single stomach and duodenum, the latter receiving both bile ducts. The presence of diverticula with each ileum was interesting, since it existed in the one which was destitute of jejunum. Immediately beneath the kidneys were structures, of nearly equal size with those glands, and which were probably unnaturally persistent Wolffian bodies; they received a large supply of blood, but were quite distinct and separate from the kidneys and ureters.

Plate I.

Drawings showing the external appearance of the double *fœtus*.

Plate II.

Dissection of the same.

Fig.

1. Drawings of dissection, showing the arrangement of lungs, heart, liver, and general circulation. No. I, fœtus on the right hand of the page. No. II, on the left.

a, a, a, a. Lungs.
b, b. Trachea on each side, separate, and having each an epiglottis.
c. Heart. No. I.
d. Right auricle, receiving venæ cavæ above and below.
e. Right ventricle, communicating with left ventricle, and having separate pulmonary artery.
f. Pulmonary artery.
g. Left auricle, receiving pulmonary veins.
h. Left ventricle.
i, i, i. Aorta, separate from pulmonary artery, but uniting into common trunk, protected by two valves; from the common trunk are given off, carotid and subclavian arteries, *k, l;* the aorta then turns to the left, and continues of large size till it reaches the kidneys. (In the drawing it is shown too small.) The branches to the kidneys and intestines were as usual, as also the division into the common and external iliacs.
m. Vena cava, arching in course of aorta to the upper part of right auricle, receiving blood from the lower extremities of No. I fœtus.
n. Inferior cava, receiving blood from inferior extremities of No. II fœtus, and from the kidney of No. II fœtus (*o*). (This vein appears in the drawing to come from the artery, but should be drawn as passing behind it.) The venous blood then passing through the liver into heart No. I.
p. Ventricles of heart No. II, communicating and giving off aorta and pulmonary arteries.
r. Both auricles on same side communicating, the upper one receiving blood from the head and neck and upper extremities, the vessel being truncated, the lower receiving the vena cava from the liver.
s. Subclavian arteries of No. II.
t. Carotids of No. II.
u, u. Liver.
v, v. Kidneys; double in No. II, horseshoe in No. I. They had the usual ureters communicating with the bladder on both sides.
x, x. Wolffian bodies?
y, y. Umbilical veins, larger in No. I.
z, z. Aorta formed by union of vessel from each side.

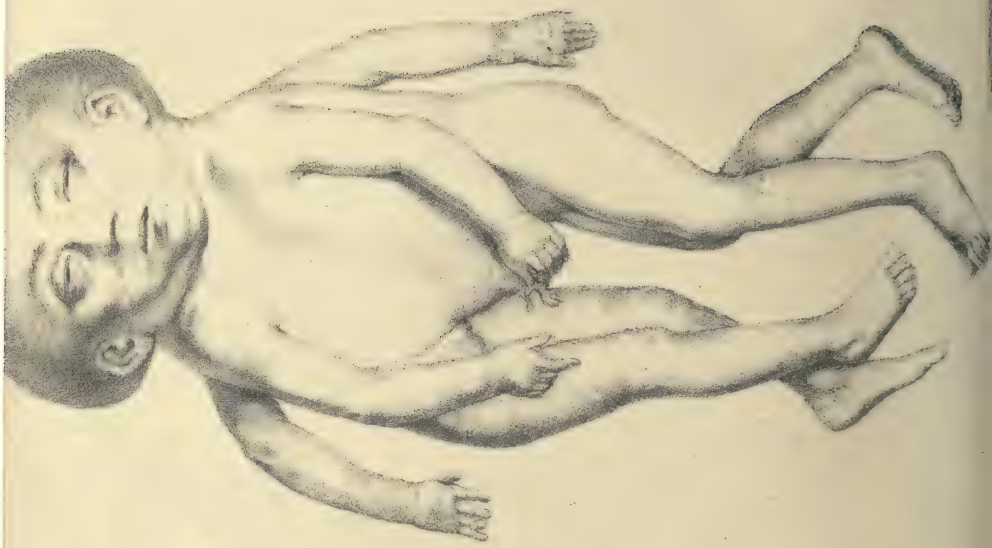
2. Digestive apparatus.

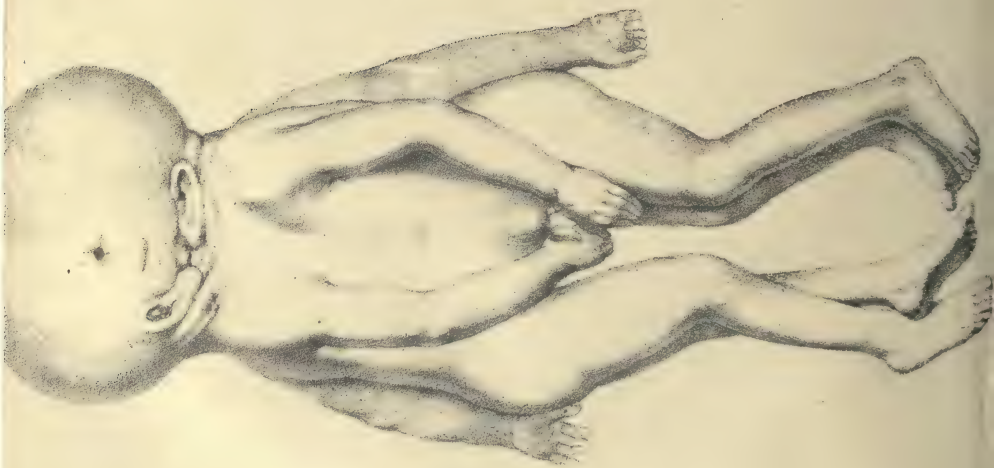
a. Tongue. *a*.* Rudimentary. *b.* Stomach. *c, c.* Spleen.
d, d. Duodenum, straight, and receiving double biliary and pancreatic vessels.
e, e. Pancreas. *f, f.* Small intestine. *g.* Diverticulum ilei.
h. Cæcum and appendix.
i. Colon terminating in the rectum in the usual manner.

3. Imperfect alimentary canal of No. II.

a. Ileum, commencing by a blind pouch. *b.* Diverticulum.
c. Cæcum, with appendix. *d.* Rectum.

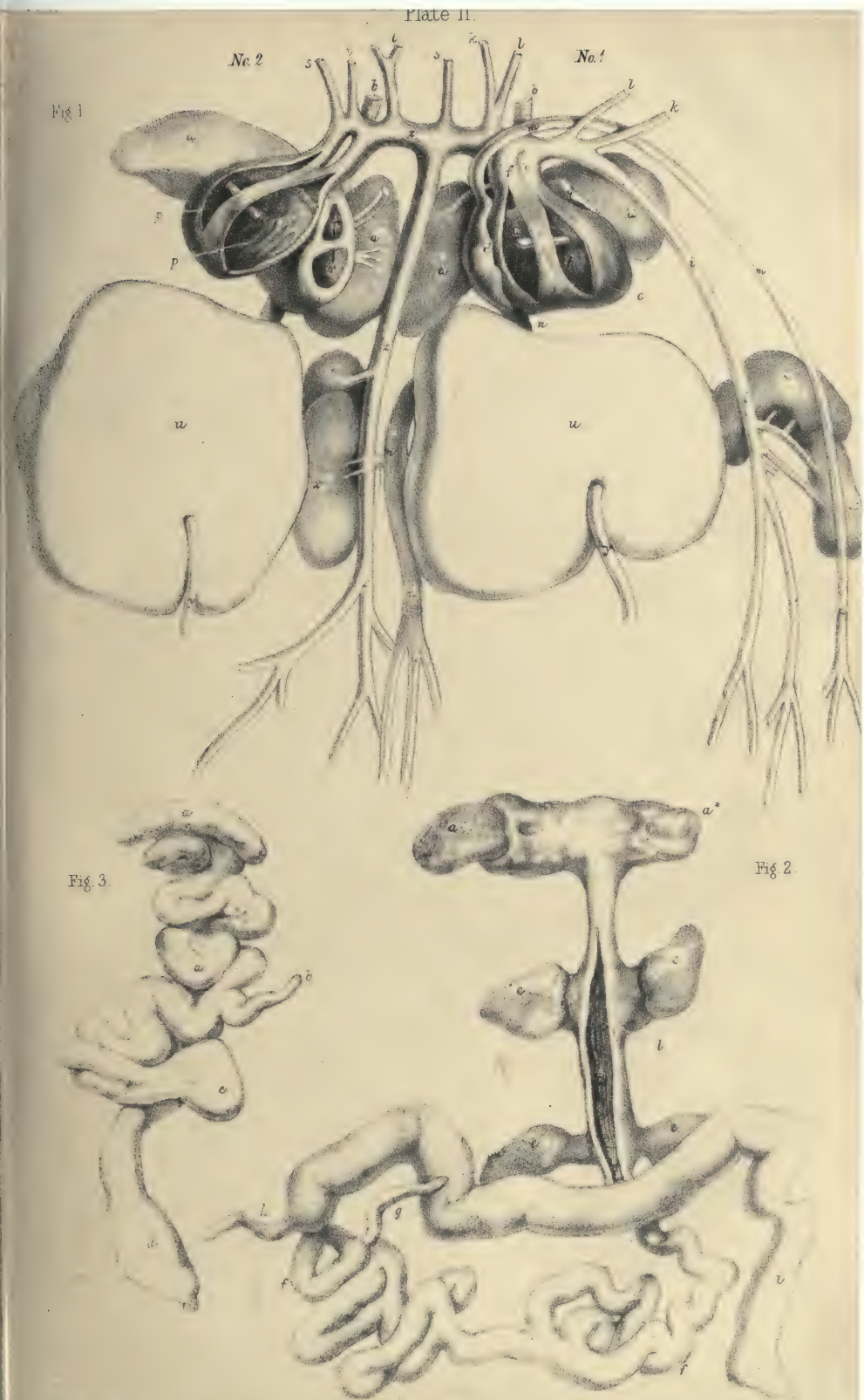
Plate I





W West Imp Hatton Garden

Plate II.



W. Hurst del. et lith.
W. West Imp. Hatton Garden.

SELECT SURGICAL CASES.

By J. COOPER FORSTER.

I. Tracheotomy for the Removal of Foreign Bodies from the Air-Passages.

Of the numerous causes which give rise to surgical interference with the trachea, none are of a more interesting class than the presence of foreign bodies in the air-tube; I therefore feel that a report of the three following cases, with some considerations resulting therefrom, must be invested with interest to every practitioner, as upon the promptitude of his actions, and correctness of his diagnosis, in most cases, depends the life of his patient.

Case 1.—I. M—, æt. 5, a sickly, ill-conditioned child, living in Bermondsey, was admitted into Lazarus Ward, 11th August, 1855, at 4 p.m. The history given by the mother was, that the child was whistling through a plum-stone which had been ground for the purpose, and that as it annoyed her and he would not desist, she suddenly slapped him on the back, the effect of which was to cause a deep inspiration, and with the rush of air into the larynx, the stone must have entered also, as he was immediately seized with dyspnœa and attempted to cough, and so urgent were the symptoms that, thinking the child was dying, she immediately brought him to the hospital. I saw him within a few minutes after admission, and found him suffering from intense dyspnœa, labored respiration, incessant attempts at coughing with rattling of mucus in the air-tubes and great distress; the countenance was livid,

extremities were cold, and the pulse feeble; he was lying on his right side and could not be moved without the cough becoming aggravated; when quiet there was no respiratory murmur on that side of the chest. The little patient apparently was dying. I felt that no time was to be lost, that the history and symptoms clearly pointed to a foreign body in the air-passages, probably the right bronchus, and that the performance of the operation of tracheotomy was the only available means of relief. Having previously satisfied myself by the passage of a probang that no substance was fixed in the œsophagus or pharynx, I cut down upon the trachea in the usual manner; a little venous hæmorrhage occurred, and without waiting to fix the tube with a tenaculum, I at once divided four of its rings, and with the violent expiratory efforts always observed, when the trachea is first opened, the stone surrounded with mucus was forcibly ejected, with immediate relief to all the urgent symptoms; the placid look of the child's countenance clearly indicating the comfort he experienced from the removal of the body; the respiration quickly became natural. The little patient was placed in the warmest bed in the ward, and a piece of wet lint applied over the wound. A slight attack of bronchitis followed, which subsided without any treatment, and he was discharged on the 26th August, fifteen days after the operation, perfectly recovered, the wound in the neck quite healed.

Case II.—T. N. P—, æt. 9, a delicate looking, but sharp and intelligent boy, living in Hackney Fields, was admitted into Naaman's Ward, 9th July, 1856. The history given was, that five days previously he was playing with some cherry-stones, and placed one in his mouth, that it disappeared from that cavity, and, as the boy thought, "went the wrong way." He was immediately seized with difficulty of breathing, fell down, and was unable to walk home, but upon ariving there soon became much relieved. During the five days previous to admission, he was frequently seized with dyspnœa and almost suffocated, and then the symptoms as suddenly abated, and he would play about quite comfortably; he was unable to sleep at night in any other positions than sitting upright or lying on his right side. He ate and drank well, and with the

exception of the attacks of dyspnœa, which occurred principally of an evening, would not have been thought to have had anything ailing him. He was taken to several practitioners and to two hospitals, but the nature of his complaint was not diagnosed until he was seen by Mr. Wallace, of the Hackney Road, who sent him to the hospital. I saw the patient soon after admission, and found him in one of his usual evening attacks of dyspnœa, he was almost suffocated, and complaining that something was moving up and down his throat; he was lying on his right side, and could not turn over to the left, or lie in any other position without feeling the most intense choking sensation; in a few minutes this passed off, and he appeared quite comfortable. The respiratory murmur was heard in both lungs. The history and symptoms clearly indicated that there was a foreign substance in the air-tube, and as it appeared that I should gain nothing by delay, I performed the operation of tracheotomy in the usual manner; there was a good deal of troublesome hæmorrhage entirely of a venous character, which did not prevent my opening the trachea with a knife immediately I had exposed it. A violent expiratory effort discharged the cherry-stone, and he had no return of his dyspnœa. The same treatment was adopted as in the other case, and he was discharged from the hospital, 21st July, quite well, twelve days after the operation. He was re-admitted on the 26th, having caught a slight cold, and there being a little erysipelatous blush about the neck, which quickly subsided, and he was again discharged on the 5th August.

Case III.—F. H—, æt. 10 months, a pale, delicate little child, residing at Lambeth, was admitted into Charity Ward, with its mother, at half-past 8 p.m., 28th February, 1857. The mother stated that two hours before admission the child was playing on the floor with a small marble and a piece of crust, that the child appeared suddenly to be choking, and she missed both the substances, and as she could not find them, concluded that the child had put them in its mouth; she therefore thrust her finger down its throat but nothing could be brought away. The severe symptoms subsided, and though the child was evidently not quite comfortable, there ap-

peared to be but little ailing it until an attack of dyspnœa occurred; the child was then taken to a neighbouring practitioner, who sent it to the hospital. Upon admission, the little patient appeared to be *comparatively* comfortable when lying in its mother's arms on its right side; immediately she placed it on its left to take the breast dyspnœa occurred, and the child gasped for breath; the breathing was stridulous and croupy, and evidently of such a character as pointed to the existence of a foreign body in the air-passages, and demanded immediate interference; the child was restless and crying, which prevented an examination of the lungs. Having satisfied myself, by the passage of a probang, that the pharynx and œsophagus were clear, I proceeded to perform the operation of tracheotomy, which, upon a child so young, presented some difficulty, though I must confess I had anticipated more than I found; the venous hæmorrhage was the only trouble and was very considerable; being unable to arrest it, I at once plunged the knife into the trachea and divided several rings cutting from below upward; the bleeding quickly ceased upon the opening being made, but from the amount of blood which had been lost the child became faint, the lips pale, and the breathing scarcely to be noticed; artificial respiration was resorted to in the manner recommended by Dr. Marshall Hall, viz., by rolling the child on its side and back again, and it quickly recovered. There was no particular relief to the child when the trachea was opened, as nothing was ejected as in the other cases. I tried to feel with the tip of my little finger if there was anything above the artificial opening, but the trachea was too small to admit it, and expecting from the history given by the mother to find a marble or piece of crust of bread come out, did not of course pass a trachea tube, rather waiting in expectation that a violent fit of coughing would expel one of the two substances said to have been lost, but was disappointed. The child struggled to get on its hands and knees, and we allowed it to do so, when it immediately rolled over to the right side, that apparently being the most comfortable position.

The little sufferer was now put to bed, but extremely exhausted from loss of blood, and apparently sinking; indeed, it never rallied from the effects of the operation, but died in

four hours, without having taken the breast or exhibited signs of perfect recovery from the collapse.

The post-mortem was made fourteen hours after death.

The lungs were found healthy and collapsed; the bronchial tubes were quite clear, no blood had passed into them from the wound. Upon removing the larynx, trachea, and œsophagus, with parts about the neck, a thin piece of bone was seen just emerging from the upper part of the larynx, and lying in the rima glottidis. Upon laying open the larynx, the piece of bone was found fixed in the rima, extending above the superior and below the inferior vocal cords, with its irregular points sticking firmly into the mucous membrane anteriorly and posteriorly, and apparently completely preventing its passage either up or down. The opening I had made in the trachea was through five of its rings and in the median line. There was no œdema about the parts. Upon investigation, it appeared that most probably this foreign body was a piece of mutton bone, and the next day, upon questioning the mother, she stated that she had given the child a small quantity of mutton broth, previous to placing it on the ground to play, but declared most positively that there were no symptoms for a quarter of an hour at least after the broth had been taken. The marble and piece of bread were afterwards found on the floor.

It will be observed that chloroform was not administered to any of these patients; it appears by common consent not to be thought advisable that it should be given in any operations connected with these parts painful as they all are, but I doubt the necessity of so restricting its use; provided anæsthesia be not carried to its utmost extent, there can be no fear that the passage of blood into the air-tube, can ever take place without exciting coughing, and its therefore being expelled. The advantages to be derived from the use of this agent, in a restless child, are immeasurably great, and I therefore should not hesitate to exhibit it another time. Dr. Snow tells me he has administered it in a few cases.

A remarkable symptom was present in all these cases which I think deserving of notice, viz., that the patient preferred lying on the right side even in Case III, when the foreign body had, I think there is fair reason to presume, not

passed into the trachea, the same desire was manifested; it is difficult to explain this symptom in this case. In Cases Nos. 1 and 11 the size, length, and direction of the right bronchus, and also the fact that the point of bifurcation of the trachea is on a plane to the left of the median line of the body, accounts for the almost universal presence of all the foreign bodies which get into the air-tubes, finding their way into that bronchus. The patient is doubtless anxious to allow the foreign substance to exert as little pressure as possible upon the vessels which surround the bronchus, and therefore lies on the side corresponding to the tube in which the body is lodged. I should suppose that, provided the foreign substance by any accident got into the left bronchus, the same anxiety would be shown by the patient to lie on the left side.

It is generally recommended that the trachea should not be opened until all external hæmorrhage has been commanded and ceased, the propriety of which rule as regards a bleeding artery no one can doubt; but where the hæmorrhage is altogether venous, as it usually is in these cases, the most advisable plan appears to me to be to relieve as quickly as possible the embarrassed circulation, and thus allow the blood to return to the heart, which, from the struggling of the patient and his violent straining, has necessarily been prevented. I therefore do not hesitate one minute longer than possible in passing a knife into the trachea, and opening it; as, directly the opening is made, and respiration has become established by the wound, the veins return the blood to the right side of the heart and the hæmorrhage ceases.

I did not in any of these cases adopt the plan lately recommended by M. Chassaignac of fixing the trachea with a grooved hook, which is passed through the integuments into it below the cricoid cartilage, and brought out at once with the handle resting on the chin of the patient, so that the necessary incisions may be made through the soft parts of the trachea on the groove, as I should consider it a somewhat embarrassing plan; though, not having used the instrument, I can but give a theoretical objection to it. But it appears to me there must be a great amount of difficulty to the operator from the restlessness of the patient, before the trachea is sufficiently opened to allow the expulsion of the foreign body, and

yet that tube is, if I may use the expression, tapped by the hook. Any one who has performed tracheotomy must be well aware of the distress and suffocating symptoms occasioned for the first few minutes after the trachea is pierced, and before the opening is sufficiently enlarged.

On the other hand, the plan of lifting up a piece of the trachea like a flap with a common tenaculum, after the tube has been laid bare, and then allowing the foreign body to be expelled, and dropping the flap down again into its original position, is very advantageous. A case occurred in the hospital under Mr. Hilton's care, three years ago, and which is reported in the 'Medical Times and Gazette' of August 5th, 1854, where this ingenious plan was adopted, and the happiest result attained. The foreign body here was known to be an ovoid glass bead, which from its shape and structure there was very little prospect of being able to seize with a pair of forceps; it could only have been ejected by the patient during a fit of coughing through the opening, and hence the advisability of the proceeding in this case and others of a like nature.

In taking a review of the last and fatal case there are several circumstances which demand special observation. In Cases I and II the history of the accident and nature of the foreign body in each was so marked as to enable me to diagnose with the most perfect certainty the true nature of the malady; but in Case III it was so at variance with what was found that I was greatly misled as to what foreign body was to be detected in the air-passages, and everything seemed to combine towards an untoward result. The time said to have elapsed after the swallowing of the broth before the symptoms occurred was, doubtless, incorrect; I cannot conceive a piece of bone becoming firmly impacted in the glottis without marked symptoms of suffocation occurring immediately, and can only believe that they must have been unnoticed, and that as no food had been given for a quarter of an hour, it was a fair inference that either the piece of crust or the small marble must have been the cause of the symptoms. To attempt to reach either of these bodies in the larynx by the finger would have been useless, though it is possible the bone might have been felt there, and it is certainly quite worth the trial at all times to pass the finger as far down both

passages from the mouth as possible, when symptoms of suffocation occur; even had the bone been felt, I must confess I should have hesitated before resorting to the amount of force which would doubtless have been necessary to extract this substance, so wedged was it into its position by its points adhering to the mucous membrane of the larynx.

As regards passing the finger upwards from the opening made into the trachea by the operation, the parts were so small they would not admit even the tip of the little finger, perhaps a probe might have struck the bone had it been passed; but the recollection of a case that occurred some years since in the hospital, where two unsuccessful attempts were made to dislodge a piece of walnut in the larynx did not offer a very promising result; and again, the supposition that one of the two foreign bodies mentioned by the mother was causing the symptoms, induced me to think that they could not be resting in the larynx, but must have passed into the trachea, and that, therefore, I had better not adopt any further proceedings.

The next question for consideration is, what was the precise cause of death? I think there cannot be a doubt that the loss of blood necessarily attendant upon an operation of this description in so young a child, was the direct and immediate cause of its dissolution; indeed, during the time the operation was being performed, almost fatal syncope occurred, though the child was restored by Dr. Marshall Hall's "ready method;" the fact that the little patient never rallied after the operation, could not be induced to swallow anything or take the breast, and the short time that elapsed, only four hours, before death occurred, sufficiently indicate the loss of blood as the sole cause; infants, it is well known, frequently sink even after a small hæmorrhage.

The death could scarcely have occurred from closure of the tracheal opening and consequent suffocation, inasmuch as there was no post-mortem evidence of there having been such œdema of the glottis as to prevent the passage of air into the lungs by the natural channel, which must have occurred had death taken place from neglect in keeping the tracheal opening patent. And, moreover, before the operation, when the child was quiet, there was a sufficient passage of air into the lungs, though

accompanied with a croupy noise. I think, therefore, it is fair to presume that, with the two openings, the natural and the artificial, an abundance of air must have entered the lungs, and that hæmorrhage and the shock of the operation combined must explain the unfortunate result. I may also observe that the dresser, Mr. Carey, was at the bedside of the patient from the time of the operation until the child died, and was most unremitting in his watchfulness, and also careful that the tracheal opening was patent.

It might be asked why was there not a tube passed into the trachea? I think that there is a sufficient answer to this question in the circumstances of the patient. When the expulsion of a foreign body was expected, it would certainly, as it appeared to me, be most injudicious to block up the trachea, and render it smaller than it naturally was, and, therefore, had there been a tube at hand small enough, I certainly should not have availed myself of it, though, as seen in the post-mortem, no harm would have accrued from such a proceeding.

There is also another question connected with this case, viz., had the bone ever been in the trachea? had it ever descended lower than seen at the inspection? I think it may be said, decidedly not; the points of the bone seemed so firmly fixed in the rima, that there was much doubt whether it could have got through that part, and I think more urgent and distressing symptoms must have arisen during life if the substance had ever been below the larynx.

II. Injuries to Veins.

The following cases of injuries to veins are invested with a certain amount of interest, as showing the almost necessarily fatal result that ensues upon division of these important vessels, when any of large size are wounded. It is said that the fatality of injuries to the circulatory system arises principally when arteries are the parts involved; but, in consequence of their structure, they are less susceptible of injury than veins, and when wounded, the results are not as rapidly

fatal; certain it is that accidents to veins are of more frequent occurrence, and, in my experience, more to be dreaded than injuries to the corresponding-sized arteries.

Case 1.—The first case to be mentioned is that of a child, Jane J—, æt. 9, who was brought to the hospital at half-past 8 p.m., on the 1st November, 1856, with two incised wounds—one in the neck, the other on the forehead. The history given by the friend was that, half an hour previous to admission, the child fell down a flight of stairs with a broken chamber-pot in her hand, and that the broken part, which was sharp, struck into the child's neck on the right side, and another portion cut the forehead; uncontrollable hæmorrhage immediately ensued, and the child was taken to a neighbouring surgeon, who was unable to arrest the bleeding; he put a piece of lint over the wound, applied pressure, and sent the child to the hospital; when she arrived I happened to be in the building, and found her perfectly blanched and pulseless, indeed quite dead, having a cleanly incised wound in the neck, situated at the anterior border of the right sterno-mastoid muscle and parallel with it, opposite the thyroid and cricoid cartilages, and rather more than an inch in length. There was also another wound on the forehead, rather longer than that in the neck, and exposing the frontal bone. I could get no account of how much blood had been lost, but evidently a large quantity.

Upon making an inspection forty hours after, and enlarging the wound in the neck, the sterno-mastoid muscle was seen to have a few of its fibres divided, and a triangular-shaped opening was seen in the outer part of the internal jugular vein, as if the sharp edge of the crockery had pierced both the anterior and posterior surfaces of the vessel, and at the same time dividing the outer side, thus cutting through more than half its circumference, but not quite transversely, as, doubtless, when the anterior coat of the vein received the impulse of the sharp edge, it partially gave way and slipped up, the posterior part being then divided, consequently the opposed sides of the vessel were not severed precisely opposite each other, and hence the triangular shape of the wound made in the vein. A little blood was effused into the neigh-

bouring tissues. No other vessel was injured. The cavities of the heart were empty.

Case II.—The second case is that of Thomas P—, æt. 28, a linen-draper's assistant, living in the Borough, who was admitted February 12th, 1857, at 3 a.m., into Accident Ward. It was stated that he got out of a window and walked on a skylight of very thick glass; that being considerably elated from the festivities of the evening, which were prolonged to this hour, he was not very steady on his legs, and fell on the glass, breaking through it, and carrying a piece before him, which, when he arrived on the floor below (no great depth), penetrated the popliteal space of the left leg. Immense hæmorrhage occurred immediately, the limb was bandaged by his friends, and the patient brought to the hospital. Hæmorrhage continued, though to a less extent. I was called up to see him, and found the man exceedingly restless, talking somewhat wildly, and very blanched from loss of blood; he had a cleanly incised wound, about two inches in length, in the popliteal space of the left leg, from which blood, of a dark venous character, was oozing in rather large quantities, considering his condition, particularly on extension of the extremity, but when flexed it partially ceased. Upon a careful examination of the wound, I found at its upper and lower part the divided ends of the popliteal nerve, several veins pouring out blood, and at the bottom of the wound what was evidently the interior shining surface of the popliteal vein and the artery below that intact. There appeared no other plan of treatment to be pursued at once than to tie all the bleeding vessels that could be seen, which was accordingly done. Hæmorrhage was soon therefore arrested, and the patient put into bed; stimulants given him; hot bottles applied to his feet, the extremities being cold; his leg raised, and head depressed. He appeared very much exhausted, restless, and extremely blanched. From being a stout and well-conditioned man, I was in hopes that he might rally from his alarming state of collapse. He did not, however, but died about three hours after I first saw him.

The post-mortem was performed the same day. Dr. Wilks's report says, the body was that of a tall, well-developed man;

skin exceedingly blanched; eyes full, pupils of moderate size; slight scratches on the forehead and the right hand. Lungs pale, filled the chest. At each apex there was some indurated tissue, resulting from chronic pneumonia; this was slightly granular; in each there was a small cavity the size of a marble. As the heart lay *in sitû*, the left ventricle was firmly contracted; the right ventricle felt flabby and empty; the right auricle partly filled with blood. On opening the heart the muscular tissue was found of moderate firmness, perhaps rather more flabby than usual; left ventricle firmly contracted and obliterated; left auricle contained a few drops of florid blood; right ventricle contained merely the smallest shred of coagulum; right auricle about half an ounce of florid blood. Stomach full of half-digested food; a very slight change in the mucous membrane. Liver pale and rather flabby.

The parts implicated in the injury were removed for a careful dissection, and were disposed as follows: There was no external saphena vein to be found, emptying itself as usual into the popliteal. The divided ends of the popliteal nerve were surrounded with blood, and lying loose in the upper and lower parts of the wound. The ligatures which had been placed around the bleeding vessels were then removed, four large sural veins were seen coming up from below. At the bottom of the wound the interior of the popliteal vein was seen, its posterior surface having been divided, the anterior part being as usual closely attached to the artery, which was immediately beneath it and untouched. The popliteal vein seemed to have divided in the centre of the space into two branches, one following the usual course of that vessel and becoming femoral; the other, and somewhat the larger branch, accompanying the great sciatic nerve up the posterior part of the thigh. The sural veins joined the popliteal within a quarter of an inch of its bifurcation, and it was at the spot of the conflux of the veins that the longitudinal division had occurred, and thus severed so many vessels, and caused such an immense amount of hæmorrhage. The large vein accompanying the sciatic nerve had two valves in it, opening upwards; thus showing that the course of the blood here was towards the centre. The sural veins also, as usual, were well supplied with valves. There was no loss of substance in the popliteal vein, though the

division of the posterior part of the vessel and the retraction upwards of that part gave rise to the supposition that a piece had been cut out; it could be made to adapt itself to its original position by simply drawing down the divided part.

To the medical jurist the first case presented a point of interest as to the probability of the wounds being the effect of accident, suicide, or murder, and great doubts were entertained at the time the child was brought to the hospital whether the statement of the means by which the injury was received was the correct one. The mother was not present. That it could scarcely have been suicidal in such a child, and with two such deep wounds, was certain. They could not have been inflicted by one so young. That it was not the act of a murderer was doubtful, unless there had been the greatest duplicity practised, inasmuch as every care seems to have been used by those around to obtain relief for the patient, and yet they were the only people in the house at the time of the infliction of the injuries, and therefore these persons must have been implicated. Again, I scarcely think it at all probable that two such deep wounds would have been inflicted intentionally, unless the one in the forehead had been made first, as that in the neck must have proved so rapidly fatal. We were then driven to the conclusion that the whole was the result of the accident, as detailed by those who found the child at the bottom of the stairs, and which was afterwards fully corroborated.

In taking a review of the second case, the occurrence of a double popliteal vein must be noticed as most uncommon. I have never seen it before; and that such an accident as division of these vessels should occur to a patient so circumstanced, and at the spot where there was a confluence of so many veins, was also most remarkable. It was almost an impossibility that any other result than death could ensue to a patient so unfortunately placed, especially when in addition we take into consideration the condition of the heart, already excited to its utmost action by the free use of stimulants, which had been taken by the patient during the evening; consequently, the body became completely drained of all its blood, as shown in the post-mortem; and from the same condition we may also account for the impossibility of again calling the heart into

action by the stimulus exhibited at the hospital after all hæmorrhage had ceased, which appeared to have no effect in rallying him from the state of collapse.

As regards the treatment of the case, the application of ligatures to the bleeding veins was the only plan to be adopted, and, though not generally recommended, is, I believe, at all times to be preferred to allowing any patient to lose even a small quantity of blood, and more especially in this case, where so much had been lost prior to the patient being brought to the hospital. I cannot call to mind any case where an ill result can undoubtedly be said to have arisen from the use of ligatures on veins; phlebitis, properly so called, being an exceedingly rare disease.

It may be asked, why was not transfusion performed in this case?

1st. It is at all times a remedy that is exceedingly doubtful, and the results, as witnessed at the hospital, decidedly negative the practice.

2d. Judging from my own experience in the matter, and the effect of the operation on all the patients on whom I have seen it performed, it has done no good.

3d. Principally, however, I avoided it on account of the decidedly injurious effects produced upon those who, in their ardour and zeal for the welfare and life of a fellow-creature, are willing to give their blood to be transfused. Upon them the effects have been, as witnessed at the hospital, most disastrous; few men in good health can afford to give half a pint of blood without seriously suffering from it; and in one case, I have no hesitation in saying, phthisis was the consequence of the abstraction; if we pass by the secondary results, of which phthisis may be considered one, as problematical and difficult to prove, no one can deny the primary effects which have been witnessed in the shape of absorbent inflammation and erysipelas. No doubt there are many young men about our hospitals ever willing to sacrifice themselves in the noblest cause, but being, as they necessarily must, much in the wards, living in London, and surrounded with every pernicious influence as regards health that can possibly be imagined, it appears to me that as their teachers, and to a certain extent their guardians, we are not justified in allowing them, nor any fellow-creature,

to hazard their lives to obtain what is after all such an exceedingly questionable result; and it was on this account that I did not perform the operation. The injection of saline fluids in cholera is not a parallel case. I have done that with decidedly well-marked temporary benefit, and would repeat it again, though I suspect the difficulties attending the performance of the operation, from the number of assistants required, will ever preclude its being tried to any great extent, even in London.

The following case occurred whilst I was reporting for the late Mr. Aston Key, and did not give me a favorable impression of the success one was likely to meet with if the operation of transfusion was performed. It was one of the earliest cases in which I saw the plan tried.

J. C—, æt. 33, was admitted into Cornelius Ward, 19th of November, 1842; a dray of empties had passed over his right arm, causing a lacerated wound, torn the biceps muscle, and also divided the cephalic vein, which was unusually large; profuse hæmorrhage occurred, and continued until he was brought to the hospital, when he was seen to be blanched, pulseless, and apparently dying. Stimulants were administered and the arm carefully bandaged. The vein was not tied, as it was not considered necessary, the bleeding having ceased, and at that time the application of a ligature to a vein was carefully avoided if possible. The following day, as he did not rally, transfusion was performed, and fifteen ounces of blood thrown in with (my report says) apparent benefit for the time, but he sank the day following, never having rallied, though he lived forty hours from the time of the accident.

No other cause of death was discovered at the post-mortem examination.

III. Extravasation of Urine in Children.

I have placed together short abstracts of some cases of extravasation of urine in children who have been admitted into the hospital during the last three years; since it is a disease which,

arising from so different a cause, and therefore requiring such different treatment, from the corresponding malady in adults, demands a special consideration, and is invested with unusual interest and importance.

Case I.—A delicate boy, æt. 2 years, was admitted in May, 1854. The day previous he had retention of urine, which was quickly followed by extravasation, involving the perinæum and scrotum; incisions were made into these parts, and a small calculus came away. On the next day a catheter was passed and retained in the bladder; this became blocked up from some cause, and extravasation again occurred, involving the lower part of the abdomen; fresh incisions were made, but from the amount of sloughing and constitutional irritation, &c., the child died on the ninth day.

Post-mortem examination.—Peritoneum covered with buttery lymph. In the scrotum there was a sloughing wound, which passed backwards to the base of the bladder, and anteriorly communicated with another near the glans penis; the whole of the cellular tissue of these parts being involved. There was also sloughing external to the prostate, extending to the left side within one eighth of an inch of the peritoneal fold; the incisions from the perinæum extended into the prostatic portion of the urethra. All the other organs healthy.

Case II.—A boy, æt. 5 years, was admitted in February, 1856. On the day previous he had difficulty in passing his water, and after a few hours it ceased to flow; extravasation of urine occurred, involving the perinæum and scrotum, which were considerably distended; incisions were made into the parts, but the extravasation increased, and shortly a calculus made its exit; there was a peculiar livid appearance upon the abdomen, veins distended, and skin of a yellow colour; extravasation having occurred as high as the scrobiculus cordis. From the immense amount of sloughing, he sank exhausted on the twenty-eighth day after admission.

Post-mortem examination.—The inflammation and sloughing of the cellular tissue had involved the abdominal muscles; these were infiltrated with a purulent secretion of a green

colour, and in places were commencing to slough. The peritoneum covering these in a most remarkable manner had escaped the contagion, there being not the slightest trace of peritonitis. The sloughing wound in the perinæum and scrotum laid open a considerable portion of the urethra, nearly the whole of the spongy portion, excepting that in the glans, was exposed; thus there remained only the anterior surface of that canal intact.

Case III.—A delicate boy, æt. 4 years, was admitted May, 1856, with symptoms of calculus in the bladder, and a stone was detected. He was brought into the operating theatre, but no stone could be felt, consequently nothing was done. Five days after this, extravasation was found to have taken place, involving scrotum, penis, and lower part of abdomen, coupled with great prostration; a sound was readily passed into the bladder, and the perinæum and urethra laid open; no stone could be detected; the child never rallied, and died in twelve hours.

Post-mortem examination.—The urethra opposite the scrotum was ulcerated, extravasation having occurred from this spot, and in a sloughing cavity lay a small stone.

Case IV.—A stout, hearty little boy, æt. 29 months, admitted September, 1856, with swelling of perinæum, scrotum, and penis, from extravasation of urine; considerable difficulty in passing water had been experienced, but not complete retention. A gum-elastic catheter was passed to empty the bladder, and incisions were made into the swollen parts; fresh extravasation occurred at intervals, for seven weeks, accompanied necessarily with sloughing; at the end of that time a small calculus dropped out from one of the several openings which had been made. He never afterwards had a bad symptom, and quickly recovered.

Case V.—A delicate boy, æt. 3 years, was admitted May, 1857. He had pain in passing water for three or four weeks. Nine days before admission had partial retention; scrotum, penis, and lower part of abdomen began to swell, and became immensely distended; sloughing commenced in various parts, and little urine only passed. On admission, he

was almost in a dying condition. Chloroform was administered, and free incisions were made into all the parts. The phymosed prepuce was slit up, a grooved director passed into the urethra; a stone was felt in front of the scrotum, which was cut down upon and removed. He quickly rallied with brandy and good nourishment. The whole of the sloughing parts were thrown off, and the wound soon began to granulate. On the eighteenth day after admission, the urine not having passed by the urethra, an attempt was made to introduce a small catheter into the bladder, but unsuccessfully; and, on the twenty-fifth day, a bougie was readily passed. This was one of the worst cases of recovery after extravasation of urine which I have ever seen.

The earliest symptom of this disease appears to be retention of urine, not always nor necessarily complete, and, looking at the cause, we should not expect it to be so; in two only out of the five cases mentioned was it present; but, in children, any diminution in the quantity of urine passed, especially if attended with swelling or pain in the perinæum, demands our serious consideration. There is no question, that in them as in adults, extravasation of urine, which may in time reach a fatal extent, can be slowly taking place, although a certain quantity of urine passes by the natural passage, and this is a circumstance which demands our constant remembrance. Patients, and even some surgeons, seem so unconscious of the amount of damage which may be going on in the perinæum, if urine to any moderate amount passes through the meatus, that we are frequently baffled in an attempt to get any account of the condition of the urinary organs by the assurance on the part of the patients that they are passing their urine. If this is the case in adults, how much more likely is it that in children the first symptoms of this disease should be overlooked or treated with indifference, unless, as sometimes fortunately happens for the little patient, the symptoms of stone in the bladder have been rather urgent for some weeks previously, or the constitutional disturbance happen at the same time to be somewhat severe, which is, however, not commonly the case.

The chief, nay, the great, peculiarity of extravasation of

urine in children, and which distinguishes it so entirely from the corresponding disease in adults, is its cause. I have no hesitation in saying that in all cases, independently of accident, it arises from a stone becoming impacted in the urethra, giving rise to ulceration of the membrane, and consequent extravasation; it is the only cause, independent of accident, which appears to me can occur to children; and if we look at the cases of extravasation of urine in adults, we find it is the most exceptional cause which gives rise to the disease in them; this of itself is, I think, sufficient to entitle it to be characterised as peculiar to children, and demands, therefore, a special consideration. It does not, however, necessarily follow that because a stone is impacted in the urethra, that, therefore, extravasation of urine should occur. A very interesting case happened to me at the Surrey Dispensary, where I removed a stone which had been, I suspect, in the urethra some weeks. There was a distinct groove on its surface, as in a coffee berry, where the urine had apparently passed along it for some time; the child's symptoms had neither increased nor diminished in severity for some weeks, which induced me to believe that the stone had been lodged in the urethra, without giving rise to ulceration and extravasation.

The age at which this occurrence takes place is generally from two to seven years; in none of the cases mentioned were the patients more than five years old.

If the previous account of the cause of extravasation of urine in children be correct—that is, if there can be no other means by which it can be produced, unless from accident—the treatment, I think, becomes very clear. Judging from the results of the cases I have mentioned, it becomes the duty of every surgeon to search for the cause, and remove it as soon as he has relieved the more urgent symptoms of extravasation by free incisions. He certainly should not wait, as has been recommended and is usually done, until the swelling has subsided, before removing the calculus, if one is suspected to be present. Of the five cases I have recorded, death occurred in three; and yet, in one of those three, the calculus came away directly, but then it must be remembered a catheter was passed, which became obstructed, and, therefore, gave rise to the same conditions as if the stone had not been removed. It is true

that in Case No. IV the stone was seven weeks before it came away, and then by accident, and yet the patient recovered; but it must be remembered that this boy was a remarkably healthy and strong little fellow; and though he lived so long, and ultimately got well, there was scarcely any day during that time that there was not the greatest anxiety as to the termination of the case; and it was not until the stone dropped out that all danger was at an end, and that he commenced to do well. The last case was undoubtedly the worst, nay, it appeared almost hopeless when first seen, and I can only attribute the successful issue of it to the removal of the stone immediately the boy came under notice.

I think we have evidence, therefore, that any amount of delay in removing the stone increases the prospect of a fatal termination, or, at all events, renders the little patient less able to withstand the great constitutional disturbance that must necessarily arise.

The practical directions to be gathered from these cases are as follows:

1. Attend to the earliest symptom, viz., retention of urine in children.
2. Incise the parts freely into which the urine has extravasated.
3. Search for and remove the calculus immediately.
4. Do not pass a catheter.

REMARKS UPON SOME OF THE SPECIMENS

OF

DISEASES OF THE BONE

CONTAINED IN

GUY'S MUSEUM,

ESPECIALLY THOSE STYLED OSTEOSARCOMA AND MYELOID,

WITH REFERENCE TO THE QUESTION OF MALIGNANCY.

By SAMUEL WILKS, M.D.

The question as to the malignancy of a new growth is the most important which can be asked concerning it, for should the answer be in the affirmative, the decision is almost equivalent to the passing judgment of a certain and speedy death upon the unfortunate subject of it. The importance, therefore, of the inquiry is a sufficient excuse for making a few remarks upon the terms cancer and malignant disease. Cancer, although divided into several varieties, has generally been regarded as a disease consisting of a specific morbid material, which once having appeared in any part of the system, resists all attempts at eradication or cure, since as often as removed it returns, or having gained strength by age, at last breaks forth with virulence, until several distinct regions of the body have yielded to its destructive influence. Such a malady is eminently malignant, and thus the words cancer and malignant disease have grown up side by side as synonymous terms, the one having reference to the anatomical nature of the growth, and the other to its wide-spread ruinous character. When, therefore, in times past, a new growth was early perceived, the

importance of knowing whether it were cancer, and was about to run this frightful course of malignancy, was reasonable. At so incipient a stage the naked-eye appearance would not solve the question, and recourse was had to the microscope to assist the surgeon in his inquiry; for great expectations were then formed of the value of this instrument in respect to its ability to determine the cancerous or non-cancerous nature of a growth, and thus form a decision upon its malignancy. Much disappointment, however, has been the result of this hope, and discredit thrown on the means employed; but this has been without good reason, for we believe that the instrument has admirably succeeded in its own line of investigation, and that its supposed failure has been in reality a bright feature in favour of its utility and importance. Its disparagement has been due not so much to its occasional indecisive answers, as to the fact of its denial of the cancerous nature of many growths which returned after removal, or even multiplied themselves in various organs of the body with the utmost degree of malignancy. The microscope has therefore proved that cancer and malignant disease are not universally interchangeable terms, and all praise rather than all blame is due to the instrument for the discovery; and this is the right lesson to learn from the fact; not that the instrument in failing to prove the connection is a sign of its imperfection, but that the use of the terms cancer and malignant disease as identical was a pure assumption on our part. Without considering the question whether the elements of cancer are peculiar or characteristic, it may be stated with some degree of confidence that the microscope is able to recognise its presence in an equal number of cases as can the naked eye, and probably oftener; but at the same time it is able to show that various growths which exhibit the utmost degree of malignancy are not cancerous, consisting, however, like the cell of the cancer, of the simplest structures, as fibre, bone, or cartilage. The microscope, too, on the other hand, may sometimes discover in a local growth the elements which exactly correspond to cancer, and are undoubtedly such, but, at the same time, little credit is placed on the decision, should the disease remain for years, and show no great evidence of malignancy. The fact, then, is clear, that the whole question has

hitherto been based on imperfect knowledge and numerous theoretical assumptions; and we cannot but think that the microscope has done immensely in improving the one and overthrowing the other, and consequently deserves much credit for the result, though of course to those who believed they held the whole truth of the matter the instrument has proved a failure, since it has failed to confirm their chronic convictions. The microscope has, we believe, ever since its general employment, tended to show that there is no more distinct line to be drawn between cancerous and non-cancerous growths than between malignant and non-malignant disease, and that there are links between the most extreme kinds of innocent and destructive growths, as between all other objects in created nature. Ordinary experience is now confirming this statement, and asking why a surgeon should call a cancerous tumour of the breast malignant, when the subject of it is in good health, and has possessed it, perhaps, for a score of years; or why tumours composed of simple fibre, cartilage, or bone, should be called otherwise than malignant when they rapidly propagate themselves through the body and destroy the life of the patient. If malignant disease be that which kills its victim by the multiplication of abnormal growths in various parts of the body, then are such as are just mentioned malignant; or if a cancerous tumour be one which ought to follow the same course, but remains stationary and local for years without detriment to the patient, then of necessity very many tumours which to the naked eye or to the microscope are undoubtedly cancerous, are not malignant.

The subject of cancer and malignant disease is so important, that our ignorance of it is the cause of an immensity of error in our present pathology, but as facts grow we trust some master hand may grapple with the whole, and reduce them to some intelligible form. At present we believe we want more facts than theories—that is, complete facts. Hitherto we have been content with partial ones, and those who know our London Museums best are aware that, until late years, they have been little better than show-rooms, there being no history to explain the meaning of the bare fact in the bottle before us, and that a small number of specimens, could they but tell their tale, would throw a flood of light upon

pathology. A perfect case, indeed, is of more value than a hundred imperfect ones.

Without prejudging the powers of the microscope, and denying that there is anything characteristic in the cell constituting cancer, the scale of epithelioma, the fibre of recurrent or multiple fibroid tumour, the bone of malignant osseous tumour, or the cartilage which sometimes pervades the organs to their destruction, we believe at present that the microscope has failed in determining any characteristic elements in these various growths. It may be true that under the particular circumstances respecting a growth in a part, with a good experience of the probabilities of only certain morbid structures invading it, a very perfect conclusion may be arrived at, or a very positive denial given to the apparent cancerous nature of a tumour when no foreign elements are found in it, but at the same time, we believe that all observations are tending to show that a cancer-cell in itself presents nothing remarkable, and that fast-growing cells, such as are seen in the gelatinous lymph about diseased joints, are not to be distinguished from it. Still, should there be any peculiarity, it is probably in reference to degree of size, as the large nucleus, rather than to any difference in kind, and the same may be said of epithelial cancer, that it owes its malignancy to the morbid excess in the evolution of scales from the surface, and that the microscope discovers no particular cell or scale which is characteristic; and this we think is borne out by experience in practice, that a simple warty tumour may become malignant, or that a papilloma and an epithelioma are not absoluely distinct. The recurrent or malignant fibroid is said to be distinguishable by some microscopists, and no doubt the fact of the abundant cell-growth and its general cancerous appearance to the naked eye, render it peculiar and different from a simple fibrous tumour; but, at the same time, we are not aware that any individual nucleated fibre composing it possesses a characteristic size or shape. Should, however, the microscope at some future time detect a marked difference in a cell, a scale, or a fibre, which should denote its malignant character, we doubt if such will be done in the malignant cartilage or bone; for in all probability these substances are the result of a subsequent formation in a tumour which would

have been fibrous, but from the mere accident of the growth being developed in the neighbourhood of bone, or in some organ where enchondroma is wont spontaneously to arise.

If the elements constituting these malignant diseases be not characteristic, the malignity is due to the fact, of their simple production, from some anterior cause, in the system, which may still be called a malignant diathesis; and this, as far as we at present see, appears to consist in a tendency to the production of some elementary tissues in the full-grown body where they should not exist. Thus, the blastema which should form the healthy supply for the nutrition of the various parts of the body produces instead, a number of elementary cells or nuclei, and these constitute simple or malignant growths according to their degree of development and rate of production. Such a mass of cells grows and destroys the patient, by exhausting the powers or by interfering with some organ with which it is in contact. That a malignant form of disease which produces a tumour composed of cell-growths, should be more common, and the tumour grow faster than one composed of fibre, is reasonable from its simpler nature; and, therefore, that such *par excellence* should be called malignant, is not remarkable; nor that if the seeds of it should be carried to any other part, that they would there also rapidly increase. If, again, from some cause, whether that be in the diathesis or in the part first excited to action, the new growth should be of a fibrous character, we see with some degree of reason why it should be of slower formation than the true cancer, and why also from the fact of its approaching so nearly in structure those simple inflammatory ones which are called benignant, why this diasthesis should present various degrees of malignancy in its result; and so a growth which in one instance is multiplied throughout the body, in another instance merely returns at the spot where it is extirpated. As it is extremely possible that in these two cases the malignancy is only a question of degree, there may also be only another degree between a recurrent fibroid tumour and one which never returns after removal. Again, it does not seem remarkable that a growth on the surface of the body consisting of a mass of epithelial cells, evolved from an epithelial surface, should be generally confined to that

part, or remain local; for, though a cell may grow and propagate in any part, or even a fibrous structure do the same, yet an epithelial cell takes root with greater difficulty; and thus, if propagated, it is only by contact, and to the neighbouring organs, or even if seen in the viscera, as the lungs, or liver, the cells are abortive, or have only imperfect resemblance to epithelium. Malignant, osseous, or cartilaginous tumours, we believe, depend, as before said, on the same cause which gives rise to cancerous or fibrous tumour, but possess their character from being produced in the neighbourhood of bone, and retain the same if repeated throughout the system; and although this origin is not always true of cartilage, yet even this has its beginning where enchondroma is wont to arise.

This method of regarding cancer must necessarily alter many of our older opinions respecting the disease. It has generally been regarded as a specific morbid element which, having once entered the body, dooms its victim to inevitable destruction, and this often by its mere presence in the system, and without any very great impairment of important organs. This view, however, is seen by experience to be erroneous, although the fact still remains true that the disease is as fatal as ever, and depends upon some latent idiosyncracy. Although we may very well believe that there exists a cancerous diathesis, yet that that may destroy the subject in which it is present, without any local manifestation of its presence, is without proof. There has been a kind of loose belief in this opinion, and that cancer is something foreign to the body as much as a poison; and having seized upon its victim, may possibly destroy it before any vital organ is injured by it. So much, indeed, has this been the belief, that if a patient has had a tumour, and its nature uncertain, the aspect or wasted appearance was sufficient to decide its cancerous nature, or if another patient should seem to be wasted without any tangible cause, a latent cancer was suspected. All our individual facts, of which we have great abundance, tend to disprove this, and show that cancer kills either by the drain on the constitution, or by its encroachment on some important organ, most frequently the latter, and then the symptoms have reference to imperfection of function of that organ, rather than to the presence of the cancer. Thus, patients with cancer of the

stomach, or of the parts in its neighbourhood, by which constant vomiting is set up, are subject to an extreme wasting; but such would be equally the case if such organs were affected by tubercle or simple inflammatory affection, which interferes with the chylopoietic function and the general nutrition of the body. This is proved by the marasmus of children, and the not uncommon cases in adults, where a simple inflammatory process, by involving important organs, has produced the most wretched emaciation, although diagnosis of cancer was unquestioned; and, indeed, in the so-called scirrhous pylorus, in its simplest form, the emaciation is extreme, and yet the disease in many cases is far from being proved to have a cancerous origin.[1] On the other hand, patients who die with cancer in less vital organs, do not necessarily waste, nor if the disease attacks external parts; for in such often a superabundance of fat is found. No surgeon, indeed, looks necessarily for wasting in his cases of cancer of the breast; on the contrary, the subjects of this disease are often seen to be remarkably fat, indeed the post-mortem examination of fat patients who have died of cancer is of almost weekly occurrence.

[1] Had space allowed we should have liked to have adduced some more facts which tend to show that many of these forms of new growths are linked to each other, and in many cases do not admit of any line of distinct separation; just as the recurrent fibroid, which, both in its clinical history as well as in its anatomical nature, takes its place between the simple fibrous and the true carcinomatous tumours. In a case, which lately occurred at Guy's, of scirrhous pylorus in a young woman, the disease had been of four years' standing, accompanied by all the usual symptoms; but the post-mortem examination showed the adventitious thickening to be due to simple fibrous growth in the submucous tissue, associated with a fibroid hardening of the neighbouring glands. Also another case where, with a similar condition of stomach, the liver was filled with a number of nodules presenting a carcinomatous appearance, but which were as hard as cartilage; and a microscopic examination presented merely a well-formed reticulated fibre-structure without any cells. There would have been a question as to the propriety of calling this cancer, had not tumours been found in both breasts, presenting the appearance of scirrhous disease, although even here the microscope showed mainly fibrous structure, associated with a few small oval nuclei. It might therefore be doubted whether scirrhous disease of the breast does not present varieties; and that some, like the present, consist of little more than an atrophied organ with a small development of fibro-cellular tissue.

Osteosarcoma and Osteoid Cancer.

We will now briefly allude to some of the cases of growths from bone contained in our museum, to which histories are attached, particularly with reference to this question of malignancy. A large number of such diseases arising from simple inflammatory affections, and others, such as local exostoses, we shall pass over, and speak only of those cases which have been called by the names of osteosarcoma and carcinomatous tumours. These terms have been most vaguely applied, and give no correct idea of the pathological peculiarities of the specimens; for, in the first place, the *myeloid tumours* which all observers have of late shown to be utterly distinct, have been placed with them. These last, therefore, we shall presently speak of as a separate class.

The term osteosarcoma includes a great variety of diseases, which pass apparently by insensible degrees into the totally cancerous.

The most marked and extreme forms of *carcinomatous disease* in our museum are so numerous, that we shall give no detailed account of them, and they are clearly distinguishable from the more benignant class by the total destruction of the parts which they invade. In the early stage of the disease, the cancerous material is seen to be deposited for the most part in the medulla of the shaft of the long bone, though it sometimes, also, grows simultaneously from the periosteum, until the whole bone is invaded and destroyed; a large carcinomatous tumour is thus seen involving the limb, including both the bone and soft parts. Sometimes the disease approaches in its mode of growth the osteosarcomatous, and springs especially from the periosteum, proceeding outwards in all directions from the shaft; but unlike it, the bone itself is affected, and at last is utterly destroyed.

In the so-called *osteosarcoma* the growth appears wholly to proceed from the periosteum, until a large tumour is formed around the bone, so that in all cases the shaft is still seen running through the tumour, and is thus distinguishable from

the perfect cancer. As the term implies, most of these tumours consist of a fleshy and osseous growth from the bone; that is, an ossifying fibrous structure, proceeding from the periosteum, around the whole circumference of the shaft. A number of fibrous rays proceed outwards in all directions, and many of these ossify so that when the tumour has been macerated, and the soft parts removed, masses of bony spiculæ are found surrounding the shafts, affording some of the most beautiful specimens in pathological collections. These growths, moreover, are generally longer than broad, and this fact corroborates the remark made by our older surgeons, that the longer the tumours of bone, so much the more malignant. Certainly, the most marked forms of cancer involve the whole bone from joint to joint, whereas, the harmless myeloid tumours presently to be mentioned, are quite round and circumscribed, while, again, those osteosarcomatous ones of which we are now speaking, hold an intermediate position in this respect; and this also corresponds to their character of semi-malignancy. Simple as are the elements forming many of these osteosarcomatous tumours, consisting of fibre and bone, yet very many are malignant; at least, in all the specimens of our own, where a history is attached, the disease has returned within the body. This, we know, is opposed to the opinions of many surgeons who have called osteosarcoma a harmless disease.

An equally common, or, perhaps, more frequent form of the disease is where, in addition to the elements just mentioned, a growth of cartilage also exists amongst the ossifying fibrous structure. Such examples when macerated still have an osseous matrix left, but in the wet specimen the amount of cartilage so often prevails over the other constituents, that the tumour approaches very much in character an enchondromatous one. Disease exhibiting these latter characters in a growth from the bone of a limb, will tend to recur in the internal organs after removal, and, probably, oftener than the simple fibro-osseous ones just mentioned.

In some other tumours, resembling these in their general appearance, cell-growths are found, which correspond to the ordinary cancer-cells, and render the disease still more malignant; and it would then appear as if a real mixture of the

more marked cancer and harmless forms of structure were combined in the same growth; and although the cancerous element may be imperfectly shown or hidden in the osseous tumour, yet in general it will be well-marked or quite pre-eminent in the disease which recurs in the lungs or other parts.

From this semi-cancerous tumour we may proceed to another, where the growth from the periosteum is undoubtedly carcinomatous, but has bony spiculæ developed in it, and is only one degree less malignant than that first mentioned of true cancer, where the soft medullary matter is so much in excess that the healthy bone becomes wholly destroyed.

Thus we see various forms of disease arising from bone, consisting of one or more structures or several combined. We may again repeat that we believe these tumours from bones are allied to the so-called malignant fibrous tumours which occur in soft parts of the body, and which return after removal, but being developed in the neighbourhood of bone, ossify, and if they should return in the internal organs, are likewise ossific. The addition of cartilage to the original tumour does not at all alter its character in this respect. With reference to the question of simple enchondromatous tumour, the question of malignancy is more difficult to determine, and this arises in part from the fact of so many opportunities of arriving at the truth having been lost, and thus the want of complete histories of the numerous splendid specimens in our various museums.

With reference to the simple bony tumour, much has to be learned; but there appear to be two most opposite conditions of this form of disease, arising probably from different causes, pursuing each its own course, and having its own peculiar formation; and although no structural difference exists between them (as far as we are aware),[1] yet such in all probability exists. For example, in the most ossific forms of the osteo-sarcomatous tumour, in those cases where the whole fibrous tissue growing from the periosteum becomes bony, resembling a simple osteophyte, probably the least degree of malignancy exists, at least we judge so, from examples before us; and thus

[1] It is probable that one may consist of simple radiating fibre ossifying, and the other have a matrix, as in cancer.

we think we may state respecting osteosarcomatous tumours generally, proceeding from the periosteum, that the harder they are the less malignant their nature.

On the other hand, there is a form of ossific growth which is so malignant that it has received the name of *osteoid cancer.* It is remarkable that this form of disease, although consisting of nothing but bone, is developed in the same way as true cancer, and runs the same course. Instead of growing from the surface of the bone in a radiating manner, as just described, the new growth is deposited in small masses within the medulla, exactly in the same way as true cancer, and continually grows until a large osseous mass is formed, which completely destroys the original textures. Thus it would appear as if one form of bony tumour consisted of an ossifying malignant fibrous on the surface of bone, had a fibrous formation, and recurred in the internal organs in the same way as the softer growth; and that another consisted of an ossifying cancerous tumour developed within the bone itself, and that it grew to the destruction of the parts in its vicinity and returned in the internal organs. That the latter growth is closely allied to cancer in its mode of formation, we judge from such cases as that sketched at Fig. 10, where the bony deposit, unless the reader were told to the contrary, would appear to be ordinary cancer attacking the bone in the same way as may be seen in many of our specimens of true cancerous disease. Its relation to cancer is also shown in those cases where simple osseous growths in the bones and lung have been represented by true cancer in the brain.

We will now briefly lay before our readers a short account of some of the specimens in our museum to which histories are attached, and it will be seen that several of the so-called innocent osteosarcomatous diseases returned in the internal organs. It may be said with some justice, that if the subsequent histories of patients whose limbs had been removed are known, it is because the disease had again overtaken them, whereas the absence of any subsequent history in the majority of cases is an evidence of their complete recovery, and therefore of a want of malignancy in the disease. The same argument, however, would have applied until late years to well-marked cases

of cancer, as of the breast, of whose future return the surgeon was in ignorance from having failed to follow them out. In the case of osteosarcoma, however, the fact of the return of the disease in the minority of instances, coupled with the absence of a history in the majority, renders the question of malignancy doubtful. The facts, as they at present stand, must be allowed to have their varied force on different minds.

Of the well-marked cancerous diseases (as before said), we have several specimens. They commence either in the medulla or periosteum, and increase to the utter destruction of the bone, and so differ from the osteosarcoma. When in an early stage the cancer is seen deposited in masses in the medulla and often around the joint, as in the osteoid disease, fig. 10, though sometimes it grows principally outwards from the periosteum, as seen in fig. 11.

Cases of Carcinoma of Bone.

Of the more recent examples of carcinomatous disease of the bone, we have one showing well the development of cancer within the bone and utterly destroying it; so that a fracture took place, as is frequently the case in this form of malady. The specimen is seen in Prep. 1162[45], which shows a large mass of cancer destroying the lower end of the femur, and also encroaching on the head of the tibia. Mr. Birkett has reported the case in the volume of the 'Pathological Transactions.' The patient was a woman, æt. 30, and the disease had been growing a year and a half. She died three months after amputation with cancerous growths in the skull, &c.

Our other recent cases have been those where the disease has mainly sprung from the periosteum, although the bone itself has been involved.

Prep. 1268[60] is a good example of this form of carcinoma of the bone, and is one of the last that has occurred at Guy's (fig. 11). The subject of it was Selina B—, æt. 8, a patient of Mr. Hilton's, and the disease was attributed to a blow two years before. The whole of the leg was enormously swollen

from the knee to the ankle, and was covered with large tortuous veins. After amputation the disease was seen to have sprung from the whole of the fibula, forming a large oval mass of cancer, in which a few remains of the bone were seen to exist in the centre. The epiphyses alone remained entire.

Prep. 1251[55] is an exact counterpart of this, being a large carcinomatous tumour growing from the whole length of the fibula, and destroying the bone. The case belonged to Mr. Birkett, and was detailed by him in the fourth volume of the 'Pathological Transactions.' The subject of it was a little girl, æt. 7, and the tumour was said to be only of four months' growth. It was amputated, and the child left well, but died a year afterwards with most extensive carcinomatous disease of the bones of the skull.

Prep. 1097[10,15] are two other recent examples of this most frightful form of disease attacking the scapula. The subjects were young girls of the respective ages of seventeen and twenty-two, under the care of Mr. Cock and Mr. Birkett. Carcinomatous growths sprung from every surface of the scapula, and rapidly grew until immense tumours were formed and the disease had penetrated the chest and lung. After death there was only the mere outline of the scapula with a few remnants of bone left in the midst of the carcinomatous growth.

Cases of Osteosarcoma.

The following five cases are those of osteosarcoma; in all of them the disease will be seen to have returned in the lungs. In the latter organs cell-growth was found in some cases, while in others the tumours consisted merely of fibre and bone, together with some doubtful cartilage.

Case I.—Prep. 1168 is a tumour of the ordinary osteosarcomatous character, consisting of a radiating growth surrounding the lower end of the femur, the shaft of which runs through its centre, although at one spot the disease has pene-

trated the bone. It is styled in the catalogue sarcomatous disease of the thigh bone. The case is reported by Mr. Travers, and is that of Thomas H—, æt. 16, who was a patient of Mr. Lucas, in the year 1804. He had stated that the tumour commenced above the knee, and rapidly grew upwards during five months from the time it had been laid open and before he came to the hospital; it then occupied the whole length of the thigh, and measured nineteen inches in circumference, and there was profuse discharge from the opening which had been made. The amputation was performed with the assistance of Mr. Cooper, and the tumour was found after removal as hard as cartilage, and in parts bony. He left the hospital with a good stump and improved health, but returned with the same disease in the chest, of which he died. This is shown in Prep. 2434[21], which is a large growth, consisting of cells and bone, involving the sternum, mediastinal glands, and lungs.

Case II.—Prep. 1162[72, 84, 96] are specimens of what is called a fungoid tumour of the thigh or osteosarcoma. In this case, the shaft of the bone is seen running through the tumour, which constitutes a very large mass of fibrous, bony, and cartilaginous structure. From the periosteum is seen growing a number of radiating fibres, spreading in all directions, in part ossifying, and amongst them a large amount of cartilaginous tissue. There is, unfortunately, no history connected with this case, but the thigh is said to have been amputated by Mr. Morgan, and it appears that the patient shortly afterwards died, and the internal organs were found affected by the same disease. Prep. 1782[80] is a portion of lung of this patient, with numerous tubercles, varying in size from a shilling to a pea, beneath the pleura, and depressed on the surface, and Prep. 2470[63] is a portion of diaphragm covered with similar tubercles. These are dry, but are seen to consist of bone.

Case III.—Prep. 1163, 1164, and 1165 show sections of the lower part of the femur, affected by a very malignant form of osteosarcoma. A large oval-shaped tumour surrounds the lower end of the femur, the shaft of the bone running unaffected through its centre. It consists for the most part of

an ossifying fibrous growth, rays of bone proceeding from the the periosteum in all directions. No nodules of cartilage can be seen in it, but the microscope shows numerous nuclei, and apparently some nucleated cells. The long action of spirit, however, has somewhat altered its character. The subject of this disease was Anne G—, æt. 17, whose leg was amputated by Mr. Key, in December, 1827. She ascribed its occurrence to a blow received several months before. In August, 1828, she began to cough, and soon expectorated blood. The pulmonary symptoms increased, with great dyspnœa, and she died in December. The lungs and thoracic lymphatic glands were all occupied by new growths. These are seen in Prep. 1749^{32} and 1400, where the tumours present a quantity of soft structure made up of nuclei and cells, which may be carcinomatous, but at the same time all the nodules are surrounded by hard bony structure.

This disease resembles the simpler forms of the osteosarcomatous, both in its anatomical characters, and in its recurrence in the lungs as bony tumours, but appears a degree more malignant in containing a soft cellular growth in the latter organs.

Case iv.—Prep. $1162^{77, 78}$ consist of sections of an osteosarcomatous tumour of the femur, called in the catalogue fungoid, because the disease was known to return in the internal organs, but in its character not differing from other specimens which were supposed to be benignant. The preparation consists of a large tumour growing from the shaft of the femur, much longer than broad, that is, occupying a great length of the bone, consisting of a dense fibrous structure, intermixed with rays of bone, and amongst these some nodules of cartilage. On one side the structure had softened, and a cavity had formed, but the shaft still ran through the midst unaffected, in the manner seen in fig. 12.

The subject of this was Sarah S—, æt. $14\frac{1}{2}$ years, who was under the care of the late Mr. Callaway, in 1841. She was too ill for removal of the limb, and shortly died. The growth in the thigh was then described as fleshy and vascular, but not cerebriform. The *lungs* contained numerous tubercles about the size of peas and chestnuts, firm, roundish, nodular, semi-

cartilaginous, some translucent and some earthy. The latter were dried, and at present show nothing more than masses of bone about half an inch in diameter, although the description of the fresh specimen would make it appear that cartilage was also present. There was no disease in the liver or elsewhere.

Case v.—This case is one of extreme interest, but we will only allude to it as it will be published in full by Mr. Birkett in whose hospital practice it occurred. A young woman had her arm amputated for an osteo-sarcomatous tumour of four years' growth. It was composed of fibre, bone, and cartilage. She left apparently well, but died six months afterwards in St. Bartholomew's Hospital with a return of the disease in the lungs. These organs were filled with large tumours, consisting of fibre, as seen in recurrent fibroid, and surrounded by bony shells composed of true osseous structure.

A case has lately occurred of this disease in the person of James W—, æt. 20, whose leg was removed by Mr. Cock for osteosarcoma of the tibia. This, like the last, consisted of a fibrous growth, radiating from the shaft of the bone, undergoing ossification, and containing numerous nodules of cartilage. The lad died six weeks afterwards of pyæmia, and no morbid growths were found in any of the organs. This shows that if osteosarcoma is malignant, some time is required for the recurrence of the disease; but the same circumstance is met with in cancer.

The following case resembles somewhat those just mentioned in its mode of growth, but consists almost wholly of bone, and probably is less malignant. It is the only case of this class of tumour in our museum of which we have any history subsequent to operation, and, therefore, will refer to it alone.

Prep. 1162 [65, 66] exhibit this osteosarcomatous growth, surrounding the end of the femur, in which nearly the whole structure is bony, so that on maceration an almost perfect resemblance of the original tumour is kept.

John T—, æt. 21, for five months his left knee had been swelling, and had been treated for strumous disease of the

joint. Continuing to increase, he came to the hospital, where the limb was amputated by Mr. Poland. The stump soon healed, and the patient left well in October, 1854. He was seen about two years after this time, and was in good health.

Cases of Osteoid Cancer.

The following is a case of osteoid cancer, where osseous deposits, commencing in the bone, were repeated in the lungs and other organs.

Prep. 1165[50, 51] (fig. 10) are extremely interesting specimens of the so-called osteoid cancer, as they exemplify the early stages of the disease. They are sections of a knee-joint and the bones adjacent, where a gradual change is commencing, by which all trace of condyles, head of tibia, joint, &c., would have been lost in one ossific mass, as is well seen in some other preparations. The present one has been before alluded to in showing how simple bony growths can take the place of cancerous ones, be developed in the same way, and pursue the same course. The anatomy of this disease is thus altogether different from that of the osteosarcomatous tumours, which grow outwards from the periosteum. Here we see a detached bony tubercle, growing within the head of the tibia, similar ones in the condyles of the femur, and also beneath the patella, so that it is very evident that if the disease had been allowed to progress the whole joint would have become destroyed by this excessive evolution of bone. The subject of this disease was Benjamin H—, æt. 56, who was under Mr. Key in the hospital, in 1841. He was a farmer, and always had good health, until a few months before, when he struck his leg. After this pain and swelling followed, and soon quite an inability to use it. The knee became much enlarged. Mr. Key removed the limb, and a section of it gave the appearances seen in fig. 10. The patient died six weeks after the operation, and a post-mortem examination was made. Beneath the pleura there were found a number of ovoid patches or scales, the largest attaining the size of a shilling. They were thin and bony, and were said to contain but little mem-

branous or cartilaginous structure. In the lungs themselves there were small angular masses of bone and a few irregular cartilaginous tubercles (Prep. 1750[45, 46]). The other viscera healthy. The stump was sloughing, and on examining the femoral artery, a large gland was found, which had become converted into a hard bony tumour (Prep. 1559[12]).

Note.—This form of disease has been styled malignant osseous or osteoid cancer, because of its carcinomatous nature. This is well shown by its course of development as well as by its occasional association with true cancer, for, as remarked in the text, as a recurrent fibroid tumour may, from the proximity of bone, become in part or almost entirely bony, so a cancerous growth may, under the same circumstances, develop within it elements altogether different from those which it would in the soft parts. The various constituents, however, may be combined.

The two following cases, which occurred in the University College, under Mr. Quain, are exceedingly interesting:

The *first* is related by Dr. Hillier, in the sixth volume of the 'Pathological Transactions.' It was that of a man, æt. 55, who had a large tumour in the thigh of two years' standing, resulting from a blow; he was too ill for its removal, but after death it was found to consist of ossifying fibre. The lungs were filled with hard nodules and bony patches, consisting of fibrous structure and *true bone.* Similar bony growths were found in the omentum and in the diaphragm.

The *second* case is related by Mr. Sedgwick, in the sixteenth volume of the 'Medico-Chirurgical Review.' A youth, æt. 16, struck his knee, which swelled, and rapidly growing in size, was amputated three months afterwards. A large tumour, consisting of ossifying fibre, was found growing from the lower end of the femur. He remained well for nearly three years, when his health began to fail, lumps were discovered growing on the stump, another on the clavicle, and he had a severe cough with difficulty of breathing. He became much wasted, the tumours grew, and a physical examination of the chest indicated some considerable solid deposits within its walls. He also before death had cerebral symptoms. A post-mortem examination discovered a tumour in the brain, which was thought to be ordinary cancer; the tumour of the clavicle was bony throughout; numerous tumours in the lungs consisted of true bone; the mediastinal glands similarly affected; viscera of abdomen and pelvis healthy. The stump was healthy; the tumours there were merely bulbous nerves. This case was an example of soft cancer and osteoid cancer combined; and shows probably that its bony character was due in part to the accidental occurrence of the disease in the bone in the first place.

Stanley also gives cases, as the following:

A woman, æt. 30, had an ivory-like tumour on the femur, and after death, bony tumours were found in glands, lungs, pericardium, &c.

A man, æt. 30, died with a tumour at the lower end of the femur, and the femoral, inguinal, and lumbar glands were converted into osseous tumours.

A man, æt. 45, had a bony tumour at the lower end of the femur, and two months after amputation similar growths were found in the abdomen and lungs.

With reference to the purely *enchondromatous tumours*, the want of a large number of observations renders it impossible to speak with any degree of certainty respecting their character for malignancy. In several instances where enchondromatous growths have been removed from the fingers of patients, the latter are known to have perfectly recovered, and in one very beautiful specimen of enchondroma of bones of the knee, removed by Mr. Key, the man was seen alive and well several years afterwards. We have specimens in our museum, removed after death, where the disease had proved fatal, but in these cases we are not sure that the local growth itself was not sufficient cause for this. Thus we have a splendid large enchondroma from the pelvis, which disease proved fatal; an immense tumour from the scapula, which also caused death, and another from the jaw, removed after death. A more complete case is that remarkable one already described in these Reports, where an enchondroma grew from the antrum, was of many years' duration, and showed little evidence of malignancy, though at last it did increase, to the destruction of the patient. The subject of it was a man, twenty-four years of age, and the growth had commenced nine years before, in the right nostril, and increased until it occupied the whole right side of the face, involving the superior maxillary bone, vomer, and molar bone. The tumour was removed by the late Mr. Morgan, in August, 1835, and the man left apparently well.[1] This growth exhibits a fine example of enchondroma. The patient lived seven years longer, during which time the disease was constantly increasing, until an immense tumour had again formed, disfiguring and hiding all the features of the face. A drawing of the cast taken after death is seen in a former volume.[2] We have also wax models of the disease when first removed, and also at the time of death.

Note.—That cartilaginous tumours will run the course of malignant disease, is clear from the example of that exceedingly interesting case related by Mr. Paget, in the thirty-eighth volume of the 'Medico-Chirurgical Transactions.' A man, æt. 37, had his testis removed for enchondroma, which was of about two years' standing. About three months afterwards he died, with evidence of pulmonary disease, and

[1] 'Guy's Hospital Reports,' Series I, vol. i, p. 403.

[2] Ibid., vol. vii, p. 491.

upon post-mortem examination the lymphatic lumbar glands were changed into enchondromatous tumours, and the lungs were found full of cartilage. It appears, from what we have above said, that this case is not so remarkable as might upon first thought have been imagined, for if a malignant fibrous tumour may become osseous from being in the neighbourhood of bone, or the tendency of an ordinary cancer in bone is to become partly or wholly osseous, and this bony tumour runs the same malignant course as a cancerous one, so, when we know that cancer and cartilage often occur together in the testes and run the usual malignant course, we see nothing very unlikely in the fact that the enchondromatous portion should preponderate while yet the malignant diathesis remain.

We may briefly allude to another class of cases which have been styled cancerous, but which have been shown by Stanley to be innocent in their character. We speak of those cases of chronic ulcer of the leg, which, the bone having become denuded, have acquired the name of malignant disease of the periosteum, and thus have even found their way among cancerous diseases of the bone in some of our museums. They are cases where, after an injury to the leg, an ulcer has resulted, and which, after resisting all attempts at cure, and having persisted many years, the integument becomes thickened and indurated, and the bone bare or covered with granulations; then the name fungoid or malignant ulcer has been applied. They are not malignant in the ordinary sense of the term, since after removal of the limb the patient perfectly recovers; neither are they cancerous, since a microscopic examination (as we have more than once proved) fails to discover in them any cancerous elements. The disease is probably allied to lupus and analogous ulcerations about the face, which much stand in want of one or more good appellations to express their *local* malignancy. During the last three years we have had an opportunity of seeing the termination of three such cases; death having taken place in one after amputation, and in the others from visceral disease, but in none was cancer discoverable; yet these had on several occasions been styled cancerous ulcerations of the leg.

As we have frequently mentioned our belief that these tumours from bone own the same cause as the various carcinomatous and fibrous tumours growing in the soft structures, but are osseous from the mere accident of their being deve-

loped in the neighbourhood of bone, we will, for the sake of perspicuity, relate one or two cases of recurrent and malignant fibrous tumour.

The recurrent fibroid tumours are characterised especially by their disposition to return at the part from which they are removed, but not elsewhere. One of the best examples we have met with of late is that described by Mr. Birkett, in vol. vii of the 'Pathological Transactions,' and may be seen by Prep. 1376[45], and by various drawings in the Museum. The woman, æt. 43, had had a tumour growing on her leg six years. This was removed, but again returned, and at the expiration of seven months was again removed. At the end of six months, another, which had taken its place, was removed, and then again recurring, the limb was amputated three months afterwards. The growth then began to sprout out at the stump, and grew to an immense size, weighing several pounds, in the course of seven months. It at last sloughed, and the patient died of exhaustion. There was no disease in the internal organs.

A similar case occurred not long ago to Mr. Cock, where a boy had had a tumour removed on several occasions from the orbit, but which as often returned. The boy went home, and was heard of last in a dying state, with a great increase of the tumour in the skull. Several other cases have occurred at Guy's during the last few years.

Cases where such fibrous tumours are repeated throughout the organs are not so common. They have been styled malignant fibroid. A case occurred a few years ago under Mr. Cock, where a fibrous tumour recurred after its removal from the gluteal region. It constantly returned, in spite of excision, and at last, the woman dying, similar growths were found in the neighbourhood, and in the lungs. Some remarkable good examples of this form of disease will be found in vol. vii of the 'Pathological Transactions,' under the head of multiple or malignant fibrous tumours.

Note.—Dr. Sibley describes, in this volume of 'Pathological Transactions,' above mentioned, two cases which had occurred in the Middlesex Hospital. The first was that of a man who for two years had had a large tumour growing on the inner side of the thigh. He died from the effects of chloroform preparatory to its removal.

Another similar fibrous tumour was found in the arm, in the lungs several, and in the liver there were about twenty, some reaching the size of walnuts.

The second case was that of a man, æt. 52, who had a large fibrous tumour in the anterior mediastinum, and protruding externally. After death a great many similar tumours were found in the lungs; a great many in the liver, some the size of oranges; also some in kidneys and intestines. The structure of all, as in the other case, consisted of interlacing fibres of wavy or areolar tissue.

Dr. Hillier, in the same volume, describes the case of a girl, six years of age, in which these fibrous tumours were not only multiple, but recurred in the same spot whence removed. A tumour of the eyeball was removed after four months' growth; it was composed of fusiform fibres. It recurred in the same place, and was again removed. A third time it began to sprout, and then a similar tumour was seen appearing on the opposite side of the head. The child died in consequence of these growing inwards on the brain, and also from the development of similar tumours under the pleura and in the lungs. The growths were called fibro-plastic and fibro-cellular.

Myeloid Diseases of Bone.

We have already spoken of myeloid tumours with respect to their innocency. By this term we mean to imply that the result of all observations made by others, as well as ourselves, is, that these tumours, when removed, do not return, and if the patient has died soon after the operation, no other morbid growths have been found in the body. Their separation, therefore, as a class is not due merely to any anatomical peculiarity, but to real and important distinctive characters in their history; and, fortunately, their recognition, when once seen, is easy. Not only are the microscopic elements well marked, but their general anatomical formation is so decided and peculiar, that we feel surprise that not more has been said on this point. Beginning, as this disease generally does, by a deposit within the end of a long bone which continually grows by expansion until a large round tumour is formed at the extremity of the shaft, it forms a striking contrast to the large, long, and irregular-shaped destructive carcinomatous tumours, or the osteosarcomatous growths which simply spring from the outside of the bone. We believe, indeed, that in the great majority of instances of myeloid tumour, the disease (if it has been once seen) cannot be mistaken. It is for this reason that we have arranged together small drawings of some

of the specimens in our museum, in order that the reader may at a glance catch their resemblance, and perceive how they differ from the ordinary osteosarcomatous or cancerous diseases of bone.

The disease appears to begin generally in the cancellous structure of the end of a long bone, by the formation of those peculiar elementary cells which once existed at the same part during fœtal life, preparatory to the development of the true osseous structure. Whether the shaft or epiphysis is most liable to be effected is difficult to say, but in Case III, where union had not yet been established, the latter was still perfect. The material made up of these polynucleated cells (resembling those of the fœtal marrow, and hence termed myeloid) continually grows in quantity until it reaches the periphery of the bone, when the latter is gradually absorbed, and the end of the shaft becomes destroyed. The myeloid matter still pushing its way out, thrusts the periosteum before it, so that the latter now surrounds it as a membranous bag, the cartilages still retaining their place upon the side nearest the joint. It is at this time, when all remedies having failed to reduce the swelling, and the limb is amputated, that an opportunity is afforded of observing the nature of the disease. What we then find, on a section of the limb, is this—a large round tumour composed of a soft medullary matter surrounded by the periosteum; the latter continuous with that of the shaft of the bone, the cartilage being still attached to its opposite end with the joint unaffected; and the jagged end of the shaft terminating abruptly in the midst of the tumour. In one specimen to be mentioned the sac has given way on the outer side, and also at a spot towards the cartilage, so that there is a small growth of the new material into the joint. This forms the only exception to the perfect saccular condition of any of the present series of tumours. The great similarity in our specimens will be seen by a glance at the Plates; and thus we hope an additional facility may be afforded to the practitioner in his means of diagnosis, when, having to remove a diseased limb for an adventitious growth, he should feel a deep anxiety as to its malignancy. There will be seen in the first nine figures of those Plates a number of rounded tumours at the ends of the bones, surrounded by membranous

sacs filled with a soft material, the joints being perfect at one end, and the jagged ends of the shafts seen entering them at the other.

There are, indeed, some varieties in these growths, although the above description expresses their general character, and the manner in which they are formed. In some, as particularly seen in Case I, the interior of the tumour is not wholly medullary, but processes of periosteum pass into it, splitting into fibres, and forming a number of loculi, in which the myeloid matter is deposited. In others, some of the loculi are filled with fluid, and thus cysts are formed in the midst of the tumour. Thus we have the fibro-myeloid and the cysto-myeloid diseases. The fibro-myeloid is a form of growth found in other parts of the body, and constitutes a very common variety of epulis; in fact, it was in such tumours, developed near the jaws, and styled by Lebert fibro-plastic, that this pathologist first discovered the peculiar polynucleated cells. Sometimes the walls of the tumour may become ossified, as is seen commencing in the membranous sac of Case IV. In Case XII, that of the tumour of the shoulder, nearly the whole circumference was osseous, and in the remarkable specimens of Case VIII, if this be a myeloid disease (and of which we ourselves feel little doubt), a large part of the enclosing cyst had become true bone; and in one case (No. X), though this is rare, the myeloid matter itself was in part being changed into bone. For further particulars with reference to the myeloid matter and its microscopic appearances, we would refer to the description and plate in the last volume of the present work; but we may just remark, in a few words, that the material, when purely myeloid, is so peculiar in persistence and colour, that it can scarcely be mistaken, consisting, as it generally does, of an opaque white material, intermixed with a semi-transparent gelatinous-looking substance, of a cherry-red colour.

The recognition of these myeloid tumours has been comparatively recent, and, therefore, sufficient facts have not been gathered from which any very positive deductions can be drawn. All observers, however, have hitherto agreed that they occur most frequently in the young, and that they are not malignant. Our own specimens, although imperfect in history, corroborate these statements.

We have twelve good specimens of this disease, besides two or three doubtful ones. Of this number four are myeloid tumours of the lower end of the femur, three of the head of the tibia, two of the head of the fibula, one of the patella, one of the acromion process of the scapula, and one of the lower end of the radius. Similar tumours have been described as originating in other bones, but the above named appear to be their favorite seats, including also the humerus, although our museum does not contain a specimen of the disease affecting this bone. It will be seen that by far the most frequent seat of disease is the neighbourhood of the knee-joint, but this fact is probably only an exponent of the more general one, that diseases of all kinds affect this joint more frequently than any other; and this agrees also with the kindred fact that disease of the lower extremity is by far more common than disease of the upper. A glance at any pathological museum will at once corroborate the statement by showing the immense disproportion between diseases of the former and the latter. How often myeloid disease exists in other bones and other parts of the body, we are not prepared to state from a review of our own specimens, but it is known to attack the skull, and it is very probable that some shell-like expansions of the lower jaw which our museum contains may be examples of myeloid disease. In the works of the older authors these tumours may sometimes be recognised under the term spleen-like tumours, spina ventosa, &c., and the accounts given of such, clearly show that many so described were not malignant. Probably Stanley had his eye fixed upon the myeloid several years ago, when he observed that the rounded fungoid tumours did not appear so malignant as the ovoid ones. The term *spina ventosa* we know was used to designate this form of disease, for some of the older preparations in our museum were so labelled. In one case (Case xi) the myeloid matter had been removed and placed at the bottom of the jar, while the membranous sac was exhibited in a state of distension as an example of spina ventosa. The remarkable one (Case viii) exhibiting merely a bony shell was also thus called. Cumin in the 'Edinburgh Med. and Surg. Journal,' quoting from Lizars, says "spina ventosa is an aggravated species of exostosis, where caries follows with suppuration within the bone. Others

confound it with osteosarcoma. No writer has been able to explain the meaning of the term spina ventosa." Lobstein, however, states that the term is an Arabian one, the latter word being explained by the fact that the Arabs referred all tumours to a *souffle malin* capable of distending the bone, and to this they added the term *epine* to denote the acute pain which accompanied some of these affections, and which resembles a thorn pierced into the flesh and bones. Such explanation refers, no doubt, more especially to a confined abscess within a bone, where the pain is often distressingly acute, rather than a myeloid tumour where there is no particular pain, until from its size it causes pressure on the surrounding parts; the term, however, was used to designate the form of disease under present consideration. Lobstein had, undoubtedly, seen several such cases, when he spoke of some forms of osteospongiosa beginning in the medulla and expanding the bone. Also, Beclard describes such under some of these forms of spina ventosa; and in Boyer's works cases may be met with of a like kind. For the latest information on the subject we may refer the reader to Mr. Gray's paper in the last volume of the 'Med.-Chir. Trans.'

Twelve Cases of Myeloid Disease.

Case I.—Myeloid disease of the lower end of the femur. (Fig. 1.)

James D—, æt. 25, a seaman, was admitted into Guy's Hospital under Mr. Cock's care, on November 25th, 1854, with a large swelling above the left knee. He gave the following history of himself: that, two years before, while in London, he struck the joint; that the blow caused it to swell, and gave him much pain, and he did not recover for some weeks. He then went to sea, and for three months performed his duties, although the limb was weak and sometimes painful; after this it became so much worse that he went into the Leghorn hospital. He again got better and resumed his work, but his leg having swollen, and being very weak, in October, 1853, he went to the hos-

pital in Malta, where he remained some months; he was then sent to England. On admission into Guy's, a well-defined tumour was observed at the lower part of the left thigh, and appeared to originate in the condyles of the femur which were much enlarged. The skin was tense and shining; the tumour felt hard, except at the sides, where it was elastic, and it measured twenty inches in circumference; the joint admitted of some degree of motion. The leg was painful, and slightly œdematous. On December 19th, Mr. Cock amputated the limb. On section of the tumour, the end of the femur was seen to be destroyed, and replaced by a growth somewhat resembling the spleen in structure—there being a number of fibrous processes passing in all directions through it, like the trabeculæ of this organ, and in the midst was a red pulp. The latter was composed of myeloid matter, and the matrix of fibre tissue, which proceeded in great measure from a layer of periosteum which passed off from the end of the bone. It thus exactly resembled Cases III and IX. The sac was membranous, the cartilages perfect below, and the shaft above ended by a jagged termination in the soft matter. The tumour when removed measured 4—5 inches in diameter. Slight hæmorrhage and suppuration retarded the man's cure, but he left well in March, 1855. He was seen lately by Mr. Cock, and was in good health (Prep. 1162[30]).

Case II.—Myeloid disease of the lower end of the femur. (Fig. 2.)

Mary Ann M—, æt. 33, was admitted under Mr. Cock's care on August 27th, 1856. She was a married woman living in Kent, and she stated that about a year before, when four months advanced in pregnancy, she fell down and struck her right knee. It immediately began to swell, caused her great pain, and she had been unable to walk upon it since. In consequence, her health had somewhat suffered, and she had been delivered of a dead child. The knee continuing to increase, she sought relief at Guy's, and a large tumour was seen to involve the right knee and the femur above. On September 23d, the limb was removed, and on a section of the bone

being made, the tumour was seen to be myeloid disease of the end of the femur. It was round, measured about five inches in diameter, and was composed of the well-marked myeloid material, composed of soft dry pultaceous matter, and exhibiting by the microscope extremely good specimens of the many nucleated cells with their numerous processes. The capsule surrounding it was membranous, and was continuous with the periosteum. The end of the shaft ended abruptly in the soft matter by a jagged termination, and the cartilages which formed the lower boundary were quite healthy. There was no fibrous reticulum in this example, and thus resembled Cases XI and XII. The stump healed very favorably, and the patient left well on November 10th (Prep. 1162^{31}).

Case III.—Myeloid disease of the lower end of the femur.

Joseph S—, æt. 15, a gas-fitter, was admitted, under Mr. Hilton's care, on April 8th, 1857, with an enlargement above the left knee. He stated that his health had been good until the month of December preceding, when the left knee began to swell, but unaccompanied by pain. The enlargement gradually increased, and the joint became stiff, or, at least, there was inability to bend it freely, and then some pain was experienced on pressure. He continued, however, at his employment until three weeks before admission, when he began to apply blisters and other treatment to the diseased part. He was seen to be well nourished, though a delicate boy, and at lower end of the femur there was a swelling of a firm, tense, and even character, which apparently consisted of the dilated condyles of the femur. The enlargement was equal on both sides, and was thus quite round in its character. The skin was free, not at all discoloured, and somewhat painful on pressure. The joint was movable and unaffected. On April 28th the limb was amputated. The growth on section was found to resemble exactly those of Case I and Case IX, consisting of myeloid matter contained within meshes of fibrous tissue. The most interesting feature in this case was that the epiphysis had not yet become united to the shaft, and the disease had occurred wholly in the latter.

The epiphysis was quite entire, forming thus a layer of bone between the tumour and the joint (Prep. 1162^{32}). A few days after the operation pyæmia came on with suppuration in the stump and pelvis, and the lad gradually sank, and died on July 31st. On post-mortem examination no disease was found in the bones or any other part of the body, except a fatty liver and the pelvic abscesses.

CASE IV.—MYELOID DISEASE OF LOWER END OF FEMUR. (Fig. 3.)

This is styled in the catalogue "spina ventosa of lower part of femur," and presented by Mr. Key. It consists merely of the sac composing the tumour, the contents having been removed; a small quantity, however, of the soft material still adherent to the walls, is sufficient to give the peculiar microscopic characters. The construction of the sac itself is so peculiar that it alone could have left no doubt as to its nature. The shaft of the femur ends by a jagged termination, as if it had been broken; above this the periosteum leaves the bone, and spreads out on all sides to form the inclosure, and below, on the lower part of the sac, are the cartilages of the condyles, quite healthy. On one side of the sac is a delicate layer of bone, exemplifying the tendency to form osseous walls in this variety of disease. It measured five inches in diameter, and was developed in the right femur (Prep. 1160^{50}).

CASE V.—MYELOID DISEASE OF THE PATELLA. (Fig. 4.)

This is a very remarkable specimen, but in its main characters it exactly resembles the others already described; thus the myeloid elements have been developed within the bone, and have expanded it until it measures three inches in length, and two inches in breadth. There was, upon first examination, some doubt respecting this specimen, as it somewhat resembled another, the subject of carcinomatous disease; in the latter, however, the bone itself was involved, and the consistence of the adventitious matter was different, whereas in this the soft interior could be wholly removed, leaving a perfect shell behind. Moreover, some of the softer contents which were still attached, when presented to microscopic examina-

tion, displayed, without any doubt, the peculiar polynucleated and sprouting cells. The front convex part of the sac was composed of fibres of the ligament interspersed with bone, thus making the whole cyst principally osseous.

The case was this: Mary G—, æt. 24, a servant, struck her knee two years and a half before; pain followed, but no swelling perceived until about twelve months afterwards. Various treatment was pursued until she was admitted into Guy's under Mr. B. Cooper, February, 1842. The tumour could easily be felt as a simple enlargement of the patella, for it could be readily moved, and the joint appeared unaffected. The girl's health was good. The leg was amputated, and she left, well. It would have been extremely interesting to have heard of the subsequent history of this case, as the Report states that there was also a small swelling at the base of the metacarpal bone of the first finger (Prep. 1210[95]).

Case vi.—Myeloid tumour of the head of the tibia. (Fig. 5.)

This is a beautiful specimen of this form of disease, but has been styled fungoid growth within the head of the tibia. A section has been made, which well displays its character. A fibrous network runs throughout from the cyst on all sides, and in the meshes is deposited the peculiar marrow-like substance. Unlike the other specimens, some of this material has softened, and thus spaces or cysts have been formed which probably once contained fluid. The tumour is perfectly round, measures four inches in diameter, is enclosed in membranous walls which are continuous with the periosteum of the tibia, the cartilages of the joint above are, as usual, quite perfect, and below, the shaft of the bone ends abruptly in the midst of the tumour. The head of the fibula and patella are quite unaffected by the disease which has not yet left the limits of the structures of the tibia in which it developed. There is no history given with this specimen, but it is undoubtedly part of the limb of a young person, judging from the smallness and delicacy of the bone (Prep. 1255[25, 26]).

Case vii.—Myeloid tumour of the head of the tibia.

This had originally been a very fine specimen of the disease, but much injured by the method in which sections had been made of it. It is much larger than the preceding one, as it measures six inches in diameter. In other respects it corresponds, but the composition of the tumour itself is wholly medullary, having no fibrous matrix, and thus resemble Cases ii, xi, and xii. It is round, the jagged end of the shaft of the tibia terminates in the interior, the periosteum continues around it to form its dense membranous walls, and above, the cartilages of tibia and condyles of femur are quite healthy. The microscope shows well-marked myeloid cells, sprouting at their circumference. From want of careful examination this had been put up as "fungoid disease of the knee-joint, commencing in the head of the tibia." (Prep. 1255[30].)

Case viii.—Myeloid disease (?) of the head of tibia. (Fig. 6.)

This is a very remarkable specimen, consisting of a large bony expansion of the head of the tibia. The bony case is not entire, and thus various holes exist in it whereby the interior is seen. Excepting in the fact of this specimen being osseous, it corresponds exactly with the other forms of myeloid disease here reported. It is true that none of the softer contents are left, but the round expansion at the head of the bone and the articular surfaces remaining quite healthy, so exactly resemble the peculiarities of the other cases, and are so different from any other form of disease with which we are acquainted, that we feel no doubt that this is a true example of myeloid tumour of the bone. That ossification of the sac is an occasional part of the process, is seen by the plates of bone beginning to form in Case iv, and in the complete bony shell which encloses the myeloid tumour of the shoulder in Case xii. (Prep. 1255.)

Case ix.—Myeloid disease of the head of the fibula. (Fig. 7.)

Daniel R—, æt. 30, was admitted, under Mr. Cock, on September 24th, 1856. He was a farm-labourer, living at Edenbridge. His health had always been good until seven months before, when he perceived a lump growing on the outside of the left knee. This, from his description, corresponded with the head of the fibula. He had no blow, nor could he attribute its formation to any cause. It gradually increased, and during the last three weeks he had been unable to walk, and had had much pain in the leg. On admission he was seen to be a healthy-looking man; and on outer side of knee and extending back into the popliteal space was a large tumour; the foot was slightly œdematous, and sensation was lost on the outer side of leg (pressure on peroneal nerve). The tumour was punctured, but nothing but blood was evacuated, and fears were entertained that it might be malignant. On October 7th, the limb was amputated, and upon section of the tumour being made, a well-marked myeloid tumour was found developed in the head of the fibula. It was quite round, measuring four and a half inches in diameter, and consisted of a fibrous capsule continuous with the periosteum, and which formed the bulk of its circumference; the cartilage completed it on the side of the knee-joint, which was quite healthy, and at the lower part the fibula ended abruptly by a jagged edge in the midst of the tumour. The interior was of a dark-red colour, and very much resembled Cases i and iii, as it contained some blood as well as the peculiar pink constituent of the myeloid matter, and also in its having meshes of fibrous tissue running throughout it. The former contained the characteristic polynucleated cells. The patient left well on November 10th. (Prep. 1268[50].)

Case x.—Bony myeloid tumour of head of fibula.

This, the last case which occurred at Guy's, was especially interesting, both on account of the mixture of bone with the myeloid matter, as well as on account of its suspicious can-

cerous nature, as evidenced both by its general appearance and its anatomical elements.

George W—, æt. 18, a leather-dyer living in the Kent Road, was admitted, under Mr. Birkett's care, on March 4th, 1857. He stated that he had felt a pain in the left leg for two years, but had only noticed a swelling for about six months. This had gradually increased until admission. He was a delicate cachectic lad, and apparently much worn by the rapid growth of the tumour. This was seen to be a large swelling growing from the outer side of the left leg just below the knee. A large number of veins were seen to be coursing over its surface, and it had the general aspect of an encephaloid tumour. The friends of the lad refused permission for the amputation of the limb, and he was taken away to be placed under quack treatment, the main feature of which consisted in well rubbing and kneading the part affected. He was re-admitted, under Mr. Cock, on May 18th, when the tumour was apparently twice the size when he left; it was very soft, fluctuated in parts, and had a most malignant appearance. The whole limb was œdematous, and the lad was reduced to the most abject state of wretchedness, from pain, irritation, and sleeplessness. It was very questionable if he would rally even after the removal of the diseased limb; it was, however, determined upon, and Mr. Cock immediately amputated. The boy at once improved, and rapidly recovered. The growth was seen to spring from the head of the fibula, and in its general appearance resembled the other myeloid tumours. It contained, however, a large amount of bone mixed with the soft material. This was granular, soft, and amorphous, having none of the characteristics of true osseous tissue. The microscope showed the usual many nucleated cells branching and interlacing in all directions, and these trabeculæ were becoming converted into bone. Much of the myeloid matter was of a milky white colour, and to the naked eye resembled cancer. The microscope, however, showed true myeloid cells, but at the same time some very large single nucleated cells. These peculiar microscopic characters combined with the cancerous appearance of much of the adventitious material, together with the general malignant aspect of the tumour before removal, caused a strong suspicion as to its possessing

a certain degree of carcinomatous nature. The future history, therefore, will be exceedingly interesting, as, if the growths should reappear within the body as true cancer, it will show that the innocent myeloid growths may be combined with the malignant. (Prep. 1268[51].)

Case xi.—Myeloid tumour at the lower end of the radius. (Fig. 8.)

A section of this has made two preparations, one wet and the other dry; in both, the softer materials have been removed and placed at the bottom of the jar, and the specimens styled "fungoid spina ventosa." The disease, however, is well marked myeloid, and consists of a tumour which has been developed within the lower end of the radius, quite round, measuring two and a half inches in diameter, having the usual soft material within, and enclosed in a fibrous capsule, with the wrist-joint perfect on one side, and on the other the jagged end of the shaft projecting into the tumour. As usual, when the disease is not far advanced, none of the surrounding parts are implicated. The microscopic examination confirmed the opinion as to its nature.

The subject of this disease was A. F. K—, æt. 36, a medical man, residing in Norfolk. He had been in difficult circumstances, and said he was subject to rheumatism, and he came to the hospital to be under the care of Mr. Key, in September, 1840. He was a fair, delicate man, and stated that the tumour of the wrist had been gradually growing for six months; it was round, softish, and appeared to have a pulsation. The limb was amputated, and the disease was considered to be soft cancer. The patient, who was naturally irritable, suffered great depression and anxiety, and died at the end of three weeks with pyæmia. The symptoms of the latter affection were well marked, and there never was any reason to suppose that he had any other internal organic disease. (Prep. 1117[20, 21].)

Case xii.—Myeloid disease of the acromion of the scapula. (Fig. 9.)

This is the specimen which was reported in full in our last

volume, and of which a coloured engraving was given, to exhibit the peculiar cerise hue of the myeloid matter. It was a large tumour, consisting of this soft material enclosed in a bony case, and which appeared to have been developed within the cancellous structure of the acromion. The subject of it was a delicate woman, æt. 27, and was pregnant during the growth of the tumour. It was removed by Mr. Cock in January, 1856, the wound favorably healed, and the patient is at the present time in good health. (Prep. 1098[5].)

Plates III and IV.

Illustrating myeloid and other diseases of the bones.

Fig.

1. Myeloid disease of lower end of femur. Case I.
2. Myeloid disease of lower end of femur. Case II.
3. Myeloid disease of lower end of femur. Case IV.
4. Myeloid disease of patella. Case V.
5. Myeloid disease of head of tibia. Case VI.
6. Myeloid disease of head of tibia. Case VIII.
7. Myeloid disease of head of fibula. Case IX.
8. Myeloid disease of end of radius. Case XI.
9. Myeloid disease of scapula. Case XII.
10. Osteoid cancer of knee-joint. Case at p. 159.
11. Carcinoma of fibula. Case at p. 154.
12. Osteosarcoma of tibia. Museum Prep. No. 1251[50].

Plate. III.

Fig1.

Fig.2.

Fig.3.

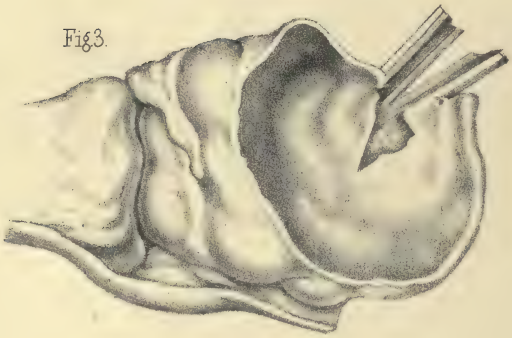


Fig.4.

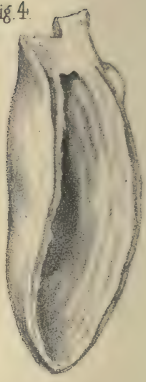


Fig.5.

Fig.6.

W.West Imp. Hatton Gardan.

Plate. IV.

Fig 7.

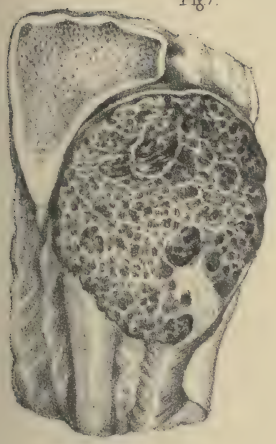


Fig 8.

Fig 9.

Fig 10.

Fig 11.

Fig 12.

W. Hurst del et lith

W. West Imp. Hatton Garden

ON THE TREATMENT

OF

PURULENT OPHTHALMIA.

By JOHN F. FRANCE.

It will be in the recollection of the readers of 'Guy's Hospital Reports,' that in the volume for 1855 there appeared a paper on Purulent Ophthalmia. The treatment therein recommended scarcely comprised any new elements; but the combination of therapeutical means possessed some originality, and (what was of far more importance) had been attended with very marked success. I was therefore anxious to make known the plan pursued within the walls of Guy's, and the results which had attended it; and, with this intent, contributed the paper referred to. I now return to the subject, with the same hope of disseminating more widely the practical benefits of a system which promises to reduce this heretofore untamed disease to the category of maladies habitually acknowledging and succumbing to the powers of medicine.

As on the former occasion, I will first adduce one or two cases in which total destruction of vision had been consummated prior to the patient's application, or was imminent at that time, in proof of the grave character of the disease, and in illustration of what would doubtless have been its issue in other examples, had not timely remedies interposed.

Case 1.—Purulent Ophthalmia.—*Eye spoiled before first visit.*

Emily S—, æt. 27, presented herself at Guy's on the 12th of June, in the current year, having been attacked two weeks

before with purulent ophthalmia. She had had a genital discharge, attended with ardor urinæ, and probably gonorrhœal, though alleged not to be so. The right eye alone was affected; but of this the cornea had sloughed or ulcerated away, leaving the iris and lenticular capsule bare. The case was of course hopeless.

Case II.—Gonorrhœal Ophthalmia.—*Both eyes lost.*

William P—, æt. 58, a tall, cachectic, and prematurely decrepid old man, a widower, and native of Ireland, had been suffering from urethral discharge with ardor urinæ, and also from some inflammation of the eyes previously to the severe attack for which he was admitted on August 20th, 1856. This had been ushered in on the 17th with pain so intense and constant as to banish sleep. On his application at Guy's, the lids were much swollen, the upper ones overlying the lower, and fully formed creamy pus was escaping abundantly from between them. On the left side there was acute conjunctival inflammation, with vividly red chemosis, and immense swelling of the palpebral lining. The cornea was semi-opaque, and its whole surface dull; through the upper part the iris and pupil could still be recognised; at the lower part towards the margin there was already straw-coloured interstitial effusion. On the right side likewise there was acute conjunctivitis, with chemosis and great swelling of the palpebral conjunctiva; but the cornea appeared sound.

The usual Guy's treatment so often detailed (including nutritious diet) was put in force, with marked good effect on the more prominent symptoms, chemosis, tumefaction, vascular injection, and pain; but, on the day after admission, there was discovered an abrasion on the surface of the right cornea; and the interstitial deposit in the left had become more decidedly purulent and more extensive. Two days later the left cornea had given way at the lower part, and through the ulcerated aperture the contents of the aqueous chambers and of the abscess were escaping; the abrasion on the right had meanwhile deepened into an ulcer. Hitherto, notwithstanding these changes, much had been gained on the disease; the violence of its course had been checked, and any

irretrievable damage staved off; while the progressive general amelioration afforded good hope that the patient would eventually escape with perfect vision on the right side, and useful vision (though impaired probably by a synechia and partial leucoma) on the left. But, from some unascertained cause, sudden exacerbation of all the symptoms took place on the 25th; and soon the left cornea became universally softened and disorganized; and the right suffered extensive and deep ulceration. Still it was not until the 29th that the cavity of the right anterior chamber was pierced; the opening then closed; again the chamber was evacuated; again replenished; and now convalescence seemed fairly set in, and vision was returning. But once more relapse took place, infiltration of the sound portion of cornea ensued, the aqueous humour again escaped, and eventually the iris remained in contact with the relics of the cornea, and vision was finally extinguished. Throughout the lingering course of this case, great efforts were made alike by medicine and diet to support the powers of the patient; but he was debilitated and cachectic in the extreme; furunculi, or small carbuncles, added to his exhaustion; and his system proved irresponsive to the means used for its invigoration. The unhappy result was, however, postponed for three months by these means and by the local treatment; for it was not until the end of November that a rational hope of preserving some amount of vision was ultimately annihilated.

On a review of the above history, the inveteracy of the disease is perhaps its most salient point. That the left eye should be lost could be no matter of surprise, for though not in an absolutely irrecoverable condition when the case was undertaken, it was too seriously affected to permit any sanguine hope of restoration. The right was differently circumstanced, and every anticipation was entertained of saving it. The progress of the malady was accordingly influenced at first in a conspicuous manner by the remedies employed, and owing to the rapid subsidence of the prominent symptoms, both eyes were assuming a more hopeful aspect. One cornea indeed had meanwhile been pierced at the margin, and the other become distinctly ulcerated; but these are changes which, however grave, need by no means be regarded with dismay when associated as they were with con-

trouled conjunctival inflammation, reduced chemosis, subdued purulent secretion, and relaxed intumescence of the palpebræ,—if only associated too with some moderate resiliency of the vital powers. Unfortunately in the present instance the last-named condition did not exist; while at the most critical juncture of the case some sudden source of aggravation arose. There was strong suspicion that the patient, whose habits had been debauched, had covertly received a supply of spirits from some injudicious friend; there was also the knowledge that he had undergone unnecessary exposure in frequenting the water-closet; there was a misgiving that possibly a too generous diet had been ordered; but the real cause of that untoward alteration on the fifth day, which at once consigned the left eye to destruction and carried the right more tardily along the same road, must now remain undetermined.

The next case illustrates at once the fatality of the disease, and the protecting power which previous chronic change in the cornea seems to interpose against its ravages.

Case III.—Purulent Ophthalmia.—*Both eyes affected; one saved.*

A. B—, aged about 32, a soldier returned from the Crimea, was admitted and prescribed for in my absence, in February, 1857. He was labouring under a moderately acute attack of the disease, which had supervened upon chronic conjunctivitis. Amid the tumefaction and discharge, the left cornea seemed clear, but whether partially ulcerated or not is uncertain; the right, as seen under the same disturbing circumstances, appeared at first sight disorganized, and as if, having given way, it had permitted the iris to protrude, and to granulate on the surface of the eye. He was ordered poppy fomentation with alum, a three-grain nitrate of silver collyrium, quinine, and good diet. Under these remedies he at first made great improvement, and mercury was withheld, as chemosis was comparatively inconsiderable. On the third or fourth day, however, when all was going on most favorably, diarrhœa suddenly supervened, and ulcerative action then set in with such rapidity that in the course of eight and forty hours the left cornea burst, and the iris soon pouted

through the breach. Meanwhile the right cornea underwent remarkable amendment, and proved to have been only in an extremely aggravated state of pannus, without ulceration; the irregular, highly vascular, and perfectly opaque condition of the part (as exposed with difficulty from tumefaction, and overspread with pus) having simulated the aspect of an uncovered and granulating iris. When this patient was 'presented,' in April, vision was extinct on the left side, but he had recovered good vision with the right eye, though some straggling vessels were still perceptible on the clarified cornea.

Mercury was not used in this case, and the utmost strength of the collyrium employed was only three grains to the ounce. I am disposed to attribute the loss of the left cornea partly to the omission of any mercurial, and to the mildness of the collyrium; but still more to the onset of diarrhœa, which, producing increased debility at the precise period when so much depended upon the maintenance of due constitutional power, gave a sudden and unlooked for turn to the prospective issue of the case.

These considerations cancel in a great measure any argument, which might otherwise be drawn from the partially unfavorable result, against the almost uniform success of the mode of treatment I have recommended. I say "almost uniform," as never having presumed to go further in its advocacy than to say, what I quite believe, "that purulent ophthalmia may almost invariably be combated with success, while success is yet possible, by the above system;" and also as having just related, in the case preceding the last, an instance which candour compels me to admit was, in respect to the right eye, one of failure. That case was, however, we have seen, attended with extreme cachexia; the patient's constitution was vitiated and exhausted to the utmost; feeble, and enervated to the last degree, he required assistance even to stand; and yet it was only after a long-protracted struggle, and several alternations of hope and disappointment, that our efforts proved finally unavailing. I cannot but regard the case, consequently, rather as an exception confirming the rule, than in any other light. Let me now exemplify the rule by the only remaining cases which have occurred to me since my former communication.

CASE IV.—PURULENT OPHTHALMIA.—*Both eyes affected; both saved.*

James M—, æt. 27, was attacked with this disease, marked by the usual symptoms—conjunctivitis, purulent discharge, chemosis, pain, and tumefaction of the palpebræ—in August, 1856. He applied at Guy's and was admitted about the 19th. The right eye was the most severely affected, and its cornea was already ulcerated at the temporal side.

The external canthus was divided in order to diminish tension, and facilitate exposure of the globe; the chemosis was scarified in radii; the palpebral conjunctiva was also scarified; and there were prescribed five grains of compound calomel pill once or twice a day, two grains of quinine thrice daily, a six-grain nitrate of silver collyrium, poppy fomentation with alum to be used continually, leeches to the lids or temple, and middle diet. The scarifications were renewed daily, and leeches in diminishing numbers applied every evening; and after three or four days, as chemosis subsided, the pill was omitted. Under these means the inflammation was reduced, and steady improvement in all respects was effected, except that the ulcer deepened.

August 25th.—The right anterior chamber was this day pierced by the ulcer, and, the aqueous humour escaping, the iris fell in contact with the cornea, the principal part of the pupil, however, being left free. The left eye was convalescing. Atropine was at once used to the right, and the same remedies were continued.

28th.—The tumefaction and chemosis had disappeared, but the right aqueous chambers continued empty. A point of nitrate of silver was therefore applied for a moment to the floor of the ulcer; scarification of the palpebral conjunctiva was repeated; and full diet, with a pint of porter, allowed.

29th.—Ulcer still fistulous. The caustic was not again applied in substance, as it seemed to cause momentary protrusion of the iris, and had failed to seal the aperture. A solution of zinc with Vinum Opii was now used alternately with the nitrate of silver collyrium, and, in a day or two, substituted entirely for it.

September 5th.—The left eye was convalescent; the cornea

clear, and free from ulceration; the right, also, was convalescing favorably; the fistulous opening had closed a day or two after last report. The anterior chamber was now replenished, and the cornea clear; a slight prominence was still apparent in the floor of the ulcer, and the pupil was angular, being adherent at one point, but the free remaining portion was ample. Wine had been allowed for some days.

The patient was discharged in October. Synechia anterior, of course, remained in the right eye; but the pupil was ample and unobstructed, and the cornea clear, except at the point of adhesion: he re-enjoyed perfect vision on both sides.

In the following, as in Case III, previous chronic inflammation probably contributed to shield the eyes from the destructive effects of the acute.

CASE V.—PURULENT OPHTHALMIA.—*Both eyes affected; both saved.*

James C—, æt. 14, had for some months had chronic catarrhal ophthalmia, for the relief of which he had attended at Moorfields and Guy's Eye Infirmaries. The left eye had become nearly well; but on August 19th, 1856, having suffered from a gleet, he experienced sudden increase of inflammation in both eyes, which issued in a sharp attack of purulent ophthalmia. The usual symptoms—inflammatory swelling of the lids, conjunctivitis, purulent discharge, and excessive pain—were manifested (most severely on the right side); and the corneæ were, on admission, opaque and vascular, but not ulcerated. The treatment now usual at Guy's, and so often particularised—consisting in division of the external canthus, daily local depletion by scarification and leeching, the use of a six-grain nitrate of silver collyrium, unceasing ablution with poppy water and alum, and the internal exhibition of a mercurial (in this case Plummer's pill), quinine, and moderately nutritious diet—was adopted with success.

On the 28th the case was convalescing; chemosis had disappeared, palpebro-conjunctival tumefaction, which had been extreme, had diminished; no ulceration of the corneæ had occurred; these structures (especially the left) were regaining

transparency; the pill had been discontinued, and the diet improved; the other remedies were persevered with.

September 5th.—For some days a solution of sulphate of copper had been substituted for that of the nitrate of silver, and the blue-stone was subsequently used in substance to the lining of the lids with benefit, scarification of the same part being continued, as were likewise tonic medicines and generous diet. The cornea was still clearing, and vision returning proportionately.

The convalescence was somewhat tedious, owing, obviously, to the foregoing chronic conjunctivitis; but the lad was at length presented in November with excellent vision restored on both sides.

Case vi.—Purulent Ophthalmia *of the left eye; vision preserved.*

Thomas T—, æt. 19, was admitted about the 23d of August in last year, with the ordinary symptoms of purulent ophthalmia. The complaint was not in its severest form, and the left eye only was affected; but the cornea had already ulcerated at the upper part, the excavation, in the form of a crescent, arching over the pupil. Mild treatment of the same kind as in the last case was prescribed.

August 28th.—Inflammation and its accompanying tumefaction, &c., had progressively declined; the ulcer had, on the whole, become deeper; but the lower portion of the cornea retaining its clearness, permitted the iris and active pupil to be seen. The right eye had shown a disposition to inflame, and its palpebral conjunctiva to become uneven and villous, as if in the first stage of the same disease; the mischief, however, seemed now in check without the ocular division of the membrane materially participating.

September 5th.—No further advance had been made by the complaint in the right eye; and in the left the inflammation was quite arrested. Deep ulceration, however, continued in the left cornea, and a fresh ulcer had formed on the nasal side. A solution of zinc with Vinum Opii had superseded the nitrate of silver collyrium. Full diet, a pint of porter, and quinine, comprised the constitutional remedies now employed,

to which was this day added opium, in grain doses, twice daily, to promote healing of the ulcers.

On October 30th, the patient was discharged from hospital; the ulcers on the left cornea having cicatrized, and a hazy nebula occupying their former site. The anterior chamber had not been opened by the ulceration, the iris consequently remained undisturbed, and excellent vision was preserved.

CASE VII.—GONORRHŒAL OPHTHALMIA.—*Both eyes affected; both saved.*

A serving boy, æt. 15, contracted gonorrhœa in February, 1856, and was admitted shortly afterwards with acute purulent ophthalmia. There were great swelling and redness of the superior palpebræ, with copious purulent secretion, high chemosis on the left side, and the same condition in less degree on the right; both corneæ, as far as could be ascertained, appeared sound. The lad still had gonorrhœa. The treatment usual at Guy's was at once put in force.

February 15th.—A large and deep ulcer was discovered at the upper part of the right cornea.

16th.—The ulcer had not extended in superficial area, but had eroded more deeply, so that the floor bulged from the pressure of the aqueous humour. After seeing him I went into the adjoining ward, and on returning was informed that he had accidentally struck the eye. Upon re-examination, it proved that the attenuated wall of the aqueous chamber had yielded to the violence, the contained humour had escaped, and the iris had consequently advanced into contact with the corneal lining. No prolapse, however, had occurred, and the pupil remained central, though contracted. Atropine solution was at once applied to the conjunctiva.

19th.—Great improvement had taken place in some respects; the tumefaction was subsiding, and the vascularity diminished; chemosis had disappeared from the left side, but remained on the right, not high, but of firmer character than at first; the left cornea continued intact; the penetrating ulcer on the right was in some measure plugged by partial bulging of the iris, but the aperture still communicated with the anterior chamber, as shown by the emptiness of the cavity. The pupil

was consequently still contracted, but three fourths of its area were free. Caustic was applied to the prolapse, and the other remedies were persevered with.

20th.—On the left side tumefaction and tension of the lids had almost gone; the white sclerotic was beginning to appear between the opening meshes of conjunctival vessels; the cornea was sound. On the right, diminution of chemosis and tegumental swelling was apparent, and the ulcer had in a measure closed. Hence the aqueous humour was retained anew, the iris had resumed its normal position in the chamber, and the pupil had responded to the influence of atropine. The whole of the right cornea was dim when compared with the left; the discharge was scanty; caustic was again used to the ulcer.

27th.—The left eye had steadily improved, and was now convalescent; the cornea healthy; vision perfect. On the right side swelling had lessened, vascularity faded, and chemosis gone; yet the entire cornea was still hazy, and the ulcer, which had reopened the anterior chamber, the day after last report, had remained fistulous in the interval, notwithstanding its partial closure by the prolapsing iris, and the daily application of a point of caustic to the latter. This day the communication with the aqueous chambers seemed again sealed, their contents being once more retained. Iron had just been added to his quinine, and contributed to this effect.

March 3d.—Altogether better as respects the eyes; no fresh escape of aqueous humour had occurred. The knee, however, was attacked with rheumatism, and the groin with bubo. Tincture of iodine was applied to both; and a grain of opium given twice daily, to aid healing action in the ulcer.

12th.—The rheumatism and bubo had yielded kindly to the application. The right eye was now progressing favorably; the corneal fistula had soundly closed, the prolapsed portion of iris had flattened down, and the ulcer was filling up rapidly; the pupil was nearly central, and open, the cornea hazy, the conjunctiva losing its morbid vascularity. Zinc solution, with Vinum Opii, had for some days been employed instead of nitrate of silver collyrium.

April 17th.—Since the last report he had steadily improved. As the nebula cleared away it had become apparent that adhesion connected the edge of the right pupil to the capsule, as

well as to the cornea, proving that the iris had participated in inflammatory action. At the above date he was presented; a shallow concavity (a depressed cicatrix) still existed where the ulcer had been; no inflammation remained; the pupil was, as just described, doubly adherent, but, nevertheless, central, of moderate size, and clear in great part, in part encroached on by false membrane. Vision with this eye was very good for all ordinary purposes, and sufficient to enable him to decipher small print. The left eye was healthy, and vision with it perfect.

Case viii.—I mention this case, in order that (as on two former occasions) my list may not consist of picked or select examples, but comprise all the instances of non-infantile purulent ophthalmia which, within my knowledge, have occurred at Guy's since my last communication. The present, however, has, for several reasons, little bearing on the practical inquiry before us.

The subject was a tolerably healthy man, of about thirty years of age, who had been suffering from chronic ophthalmia. With this complaint he made application at a London Ophthalmic Hospital, and gained admission as an in-patient. Probably the case was thought likely to prove intractable under milder measures, for it was resolved to test in it a recent continental recommendation, and inoculate the man with purulent ophthalmia. This was accordingly done, and the disease produced, as intended. The corneæ, protected by the chronic vascularity, of which, it would seem, they were previously the seat, passed unscathed through the ordeal, and escaped ulceration. The object, however, of this perilous experiment was not accomplished; for the patient, on leaving the hospital referred to, applied at Guy's, labouring still under purulent ophthalmia in its chronic stage, and presenting a vascular network over each cornea. This condition, associated with a thickened and villous, if not granular, state of the palpebral lining, was remedied by daily scarification of the tarsal conjunctiva, application of Cupri Sulphas to it, the regular use of a six-grain solution of the same salt as a collyrium, and attention to the general health. There can be little doubt that the same means would have effected the same object in the first instance, had they been employed instead of the heroic plan which obtained the preference.

The two following cases occurred while this paper was in press.

Case ix.—Purulent Ophthalmia.—*Eye spoiled before first visit.*

Edward P—, æt. 16, having been previously quite well, free alike from disease of the eyes or of the urethra, was, on Friday, the 24th of July, 1857, attacked with acute purulent ophthalmia. In the interval of a week which elapsed ere he resorted to Guy's, the disease had caused permanent destruction of vision, for the cornea was then in a state of hopeless disorganization.

Case x.—Purulent Ophthalmia.—*Both eyes affected.*

Mary S—, æt. 56, had been tending the child of a friend which appears to have been labouring under infantile purulent ophthalmia, and applied to the hospital under the impression that she had contracted a similar disease. This proved to be the case, though happily the attack was comparitively a light one. There was, on August 4th, suppurative inflammation of the conjunctiva, with chemosis and severe pain, but inconsiderable swelling of the lids; and the cornea was healthy. Being much depressed, she was ordered quinine, middle diet without beer, poppy fomentation with alum, nitrate of silver collyrium (a grain and half to the ounce), and six leeches to each outer canthus. No mercurial (except in a purgative powder); and no scarifications were thought necessary in so mild a case. On August 9th she was doing well; chemosis had nearly disappeared; conjunctivitis, however, continued considerable, with gleety discharge; the cornea remained sound; complaint was made however of her remissness in the use of fomentation and ablution to the right eye. She would not take porter, and was ordered two ounces of wine instead.

Aug. 12th.—The left eye was still improving; the inflammation of the right conjunctiva, though diminished, was not so much lessened as for the time it should have been; and at the upper and lower verge of the cornea a narrow, but deep, curvilinear ulcer was now for the first time apparent, the general surface of cornea being quite clear. The patient was enjoined yet more strictly than before to use the fomentation thoroughly; two or three leeches were applied for some successive nights to the outer canthus; the bowels were freely opened by a drop of croton oil, and the quantity of wine was augmented. By the 19th, the conjunctivitis had so much abated that I had substituted a solution of zinc and opium for that of the nitrate of silver; the chemosis had entirely disappeared; and the ulcers, not having spread materially either in depth or extent since the last report, were now healing kindly. Vision was perfect on both sides.

Such, then, is the additional experience I have to record of purulent ophthalmia. In glancing at the foregoing histories, in order to estimate duly their bearing on the all-important question of treatment, the first, the eighth and the ninth cases (being introduced mainly to complete the series) may be passed over cursorily as having incidental reference only to the particular course under inquiry. The first and the ninth having already terminated in destruction of the organ before they came under observation, simply serve to reaffirm the pernicious character of the malady; while the eighth, also, not not having come to Guy's until the active stage had passed by, and the plan of treatment pursued being unknown, cannot either support or mili-

tate against the mode pursued in the other cases. Suffice it to say, in reference to this case, that though it proves that an intentionally inoculated purulent ophthalmia may arise and decline, without inflicting permanent injury on eyes protected by pannus; yet it affords little encouragement to repeat so hazardous an experiment, since, on the subsidence of the acute symptoms, the chronic ophthalmia remained much as before. The responsibility of exciting so formidable a disease will not lightly be incurred by practitioners who esteem their patient's welfare the paramount consideration; especially when it is remembered, that cases of this kind are generally quite amenable to the plan which eventually cured the present example.

Putting aside, then, the first, the eighth and ninth cases, seven remain as tests of the efficacy of the therapeutical means employed. I have already commented on the first of this group, and shown how unusually adverse were the circumstances, how entire the patient's constitutional prostration, under which so unfavorable a result ensued. Exceptional as was this case in its termination (even though gonorrhœal), when viewed in connection with the long list I have now placed before the profession, it was not less exceptional in the condition of the subject; and cannot reasonably be quoted in disparagement of the mode of treatment I have laboured to extend. The issue of the remaining six cases was better in accordance with the auspicious results heretofore attained. All, with a single exception, were affected on both sides; and of the eleven eyes thus attacked, only one has been lost. Among the number saved were two organs suffering from the gonorrhœal variety of the disease.

Is the degree of success in the management of purulent ophthalmia exemplified in the above cases, and those previously published, sufficient to recommend the mode of treatment they illustrate to general adoption? Knowing well the ordinary fatality of the complaint, and relying on ample experience of late years in evidence of its curability —experience I have endeavoured faithfully to embody in these communications—I answer with confidence in the affirmative. The following is therefore reprinted with slight variation, in the hope that the system may gradually work its way.

Synopsis of the treatment of Purulent Ophthalmia in use at Guy's Hospital.

a. During the acute stage :—

1. Local depletion by leeching the lids, and scarifying their inner surface, every twenty-four hours.

2. Division of the external canthus, and puncturation of the integuments of the lids (as in erysipelas), when the tension and inflammatory swelling are extreme and prevent exposure of the globes.

3. Scarification of the ocular conjunctiva, according to Tyrrell's mode in radii, daily, so long as chemosis is high.

4. Application between the lids, every three, four, or six hours, of drops of a solution of its nitrate of silver, containing from three to eight grains in the ounce of distilled water; the strength of this collyrium and frequency of its use depending on the severity of the symptoms, and being, consequently, modified as these abate.

5. Constant fomentation and ablution with decoction of poppies having a drachm of alum dissolved in the pint.

6. Exhibition of mercury, after proper relief of the bowels,[1] until the chemosis is subdued, or the mouth affords the earliest signs of the action of the mineral. This remedy must be guardedly used, when the stage of active interstitial effusion, marked by rising chemosis, has given way to that of ulceration manifested on the cornea. It should then be accompanied by a tonic regimen, and by—

7. Use of quinine, in cases where debility prevails at the outset, or is subsequently induced.

8. Moderately nutritious diet, which is generally preferable from the commencement, and may be progressively improved as the disease recedes.

β. In the convalescent or chronic stage,—

9. Tonics in diet and regimen, varied local astringents of mild character, and counter-irritants must be used to complete the cure.

[1] Croton oil is the most eligible aperient, when one is required, as the rapidity of its effect occasions the least possible delay in commencing the mercurial.

OPHTHALMIC CASES.

By JOHN F. FRANCE.

Melanotic Cancer of Eye.—*Extirpation of globe.*

Elizabeth M—, aged between 40 and 50, was admitted into Guy's in April, 1856. She had many years before been under the care of the late Mr. Morgan; and at his death, in 1847, fell under my own. At that time (I write from recollection) there was disorganizing mischief of the left globe, accompanied with neuralgia and vascular excitement. The complaint, not being distinctly inflammatory in its origin, was regarded with suspicion; but still the hope was entertained that it might not be malignant, and palliative remedies only were resorted to when (as at various times) aggravation of pain supervened. There was even then some deformity of the sclerotic, and vision was quite extinct.

The patient re-appeared at the above date, with impaired health and sallow complexion, suffering greatly from the painfulness of the affection. The globe was now quite disorganized, somewhat enlarged, tuberculated and irregular in form, discoloured and dark, overspread with varicose vessels; and from it sprouted at the lower part a fungus, which overlaid the margin of a barely recognisable vestige of opaque cornea, of perhaps a quarter the natural extent. The motions of the globe were preserved, and the lids were healthy; an enlarged absorbent gland was perceptible in front of the ear on the surface of the parotid.

Upon consultation, the propriety of extirpating the diseased globe was determined upon; and after a short interval, owing to the appearance of the catamenia, I performed the operation

on May 1st. This was executed in the usual mode; the external canthus was divided, the mass transfixed with a ligature, a double-edged scalpel was then made to pierce deeply at the inner canthus and cut out along the floor of the orbit; the connections of the globe above were divided in a similar way, the finger and handle of the scalpel were used to ensure the complete insulation of the globe, the inferior oblique muscle which was thus felt undivided, was cut through; and a pair of blunt-ended scissors, curved on the flat, being introduced at the temporal side of the cavity, the straight muscles, optic nerve, &c., were severed. The mass now came away without difficulty; and brisk hæmorrhage which ensued from the ophthalmic artery was readily controlled by pressure. The nerve appearing unsound at the section, an additional portion was detached from the surrounding parts, and removed with scissors as near as practicable to the optic foramen; but this portion too, unfortunately, appeared infiltrated with melanoid deposit at both extremities. Bleeding was not renewed on taking away the plug at first inserted in the cavity, and consequently a pad saturated with cold water, and applied externally to the lids, was the only dressing used. Insensibility was maintained throughout the operation by chloroform.

May 17th.—Convalescence had steadily advanced, with only the interruption of inflammatory swelling of the gland over the parotid, and subsequently of several in the neck accompanying sore throat. The former had now diminished to a smaller size than before the operation, and the others also had become smaller and less tender under the use of leeches. There had been scarcely any suppuration from the orbit, and the lids were now sinking, owing to re-absorption of inflammatory effusion. She had lost the pain and felt much relieved by the operation. Cold had been applied locally throughout, and the diet, which had been spare for the first few days, was made more generous, and comprised mutton chop, porter, and wine.

23d.—She quitted hospital for the country, being convalescent from the operation but still weakly. The tenderness and swelling of the cervical glands were much reduced, and the small absorbent gland over the parotid was scarcely discoverable.

On examination of the tumour, the outline of the sclerotic seemed preserved, except at the lower part; where a line of

tubercles, commencing from the remains of the cornea, which they overlapped in front, involved the insertion of the inferior rectus, and extended back to the entrance of the optic nerve. This structure was deeply imbedded in, or rather wrapped round by, a large, soft tubercle; and its substance was, as already mentioned, infiltrated with melanotic material for a considerable distance from the globe, while the theca appeared quite healthy. The mass representing the globe of the eye consisted of solid, blackish, moderately firm substance, subdivided by septa; a section showed nearly the whole included in a line seeming to indicate the remains of the sclerotic, on the outer surface of which however, at the lower part, as just described, the new growth had also taken place. It appeared to me that this texture had formed the nidus of the disease.

The following is the account of the microscopic examination, which Dr. Wilks kindly instituted:

"*Melanotic cancer of eye.*

"The tumour, from having been so long in spirit, was much altered in appearance, and the examination therefore took place under great disadvantages. The surrounding white dense structure in the position of the sclerotic was composed of fibre-tissue, having amongst it nuclei and cells. The black matter filling the cavities of the eye was soft, and could easily have been scooped out by the scalpel. The microscope showed this also to contain a delicate fibre running throughout, but this was in very small proportion compared with the other elements. There were clusters of nuclei, pigment, and vitreous-looking, amorphous plates. The nuclei were large, lay in juxtaposition, and appeared in some cases to have a cell-wall, although this was not always very evident. The pigment appeared of a dark-brown colour, and consisted of portions of all shapes and sizes, not having any definite form. The action of the spirit may have altered any original organic shapes which the melanoid matter may have had. The amorphous, transparent-looking substance was an albuminous or colloid material, such as is constantly found in degenerated structures.

"The microscopic examination, it is seen, cannot give a decided character to the composition of this growth. The abundance

of nuclei, however, clustered together without any particular arrangement, resemble what is seen in cancerous tumours. The appearance of the section soon after removal gave to all who examined it the idea of cancer, and the diagnosis formed in this way is in the present instance probably more to be relied on than that obtained by the microscope under considerable disadvantages."

The preparation is now in the Museum, marked 1669[45].

I regret that I can only supply the sequel of this case from the indefinite account of non-professional relatives, having applied in vain to the practitioner in attendance. It appears that the relief afforded by the operation was only temporary; about two months after her return into the country, the patient had some marked aggravation of disease; painful "lumps formed about her legs and body;" swelling of the trunk and extremities occurred; extreme debility accompanied these changes; and she at length sank, exhausted by suffering, on the 4th of December; seven months, that is, after the removal of the primary seat of disease. It need scarcely be said that a more favorable result could not be anticipated;—that operation was not resorted to in the first instance cannot be regretted, as nine years were added to the patient's life after that period; that the operation should be performed when it was, immediately on the patient's reappearance, was a matter of necessity from the urgency of the symptoms, and of hope from the probable circumscription of the disease; but that the case would terminate fatally in a few months, was of course foreseen, when contamination of the optic nerve beyond the point where its division was practicable, became evident on completing the operation.

TUMOUR OF THE GLOBE.—*Enucleation from the ocular capsule.*

Emily C—, æt. 7, a delicate, fair-skinned child, was sent up from the country in April, 1857, having for some months had a tumour forming in the left eye, which protruded the sclerotic on the nasal side at the position of the ciliary body,

and embraced half the circumference of the globe. The anterior chamber was occupied by this growth, but the cornea remained clear. In hope of the deposit proving inflammatory or scrofulous, various remedies were used, but without avail; so that, after a month's residence in hospital, it was determined, in consultation with Mr. Poland, to excise the globe after Bonnet's method. The case was well adapted for this procedure, as there was no reason to apprehend that the disease had anywhere extended beyond the globe, or involved contiguous tissues; the globe could be freely moved in the orbit, was not greatly enlarged, and there was no sign of glandular affection.

Accordingly, the lids being held apart by specula, the conjunctiva was divided in a circle around the cornea with scissors, and the tendons of the external superior and inferior recti were successively seized with forceps, and cut across close to their insertion. The inferior oblique was then raised on a blunt hook and severed; scissors curved on the flat were next introduced at the external canthus, for the section of the optic nerve; and lastly, the internal rectus and superior oblique muscles were cut, and the operation completed. The patient was kept under the influence of chloroform during the operation, which produced vomiting at the time and in the afternoon, but no subsequent inconvenience arose, and in a few days the little girl was convalescent, and only waited in hospital to be fitted with an artificial eye.

The tumour proved to be a new growth of probable malignancy (a character corroborated, but not rendered conclusive, by microscopic examination), sprouting from both sides of the anterior extremity of the choroid, and passing through the pupil, as also making its way through the ciliary ligament, to spread out in the anterior chamber. The lens remained nearly *in situ:* and the remainder of the globe was healthy. The preparation is in the Museum, marked 1669[50].

Tumour of the globe.—*Enucleation.*

Thomas B—, æt. 18, a thin, weakly lad, was attacked with symptoms in the right eye simulating those of iritis; by which name, indeed, the disease was designated on his first attend-

ance at a London Eye Infirmary in the early part of the present year. The case, however, did not yield to the treatment prescribed, but advanced; and assuming a more grave aspect, gave occasion to a consultation, at which it was determined to recommend removal of the globe. The patient and his father, reluctant to consent to so formidable a measure, appealed to Guy's, where medicinal treatment was adopted without any decided effect upon the malady, unless diminished tension of the sclerotic were to be so regarded.

The condition of the eye at the beginning of July, when the lad had become an in-patient, was as follows: The sclerotic slightly flaccid, showing several enlarged vessels on its surface, and a distinct inflammatory zone around the cornea; the latter texture healthy; the pupil expanded to the utmost; at parts of the circle the iris was altogether obliterated, at others it was adherent to the capsule, had lost its reticular aspect and colour, and permitted the pigment on its posterior surface to appear; the anterior capsule was transparent, except at the points of adhesion referred to, where bands of false membrane, here whitish, there pigmentous, were extended upon it; while a beautifully delicate annulet of vessels could be seen by the aid of a glass within the area, and fringing the edge, of the pupil; the crystalline was for the most part transparent; in contact with its posterior surface was seen a concave buff-coloured expanse of opaque substance, permeated in parts by fine pink blood-vessels, and excluding of course the remaining fundus of the globe from view. Vision had long been entirely extinct: there was no evidence of neighbouring glandular affection.

The disease having been for some time stationary, and indeed having shown a disposition to terminate in atrophy, it became a question whether or not operative interference should be employed. The growth seen behind the pupil was probably of a scrofulous, or tubercular nature, and would not compromise any other part; a similar case under my own care some time back had simply resulted in absorption of the humours, and contraction of the globe to a small, quiescent nodule: but on the other hand, the boy's health was manifestly bad; the appearances of the eye had much in common with those presented by incipient fungoid disease, from which no conclusive mark of distinction could be assigned; and the function of the organ

was already annihilated. Virtually the problem was reduced to this point;—whether it were better to keep for an indefinite period a disorganized and useless globe, involving a certain risk of malignant disease, of sympathetic affection of the opposite side, and at best but affording a convenient stump on which to fix an artificial eye; or, by a painless and not severe operation, to extirpate the source of anxiety, to open the prospect of at once restoring the patient to his ordinary avocations, and by the insertion of the artificial substitute to remedy in a certain measure the deformity already existing. The latter alternative was, on mature consideration, adopted; and accordingly I performed Bonnet's operation described in the last case, while the patient was kept under the influence of chloroform.

In a few days the boy was convalescent; the conjunctiva free from inflammation, and any material amount of discharge; its ocular portion effectually covered in all the remaining contents of the orbit; the comparatively small circular aperture in this portion, through which the globe had been withdrawn, had contracted to a navel-like puckered orifice; and the insertion of an artificial eye at once afforded marked improvement to the lad's appearance, and gave him great comfort, by supporting the lids in their natural convex form.

On making a horizontal section of the globe, the following appearances were presented: The vitreous chamber was chiefly occupied by a white solid growth in close apposition with the crystalline in front, and extending to the entrance of the optic nerve behind. On the temporal side of this growth, immediately within the choroid, there was a cavity containing a grayish, semi-opaque, and semi-fluid substance; and between the two morbid products, but consolidated with the former, was traceable what seemed to represent the collapsed and compressed retina. The choroid appeared perfectly healthy; the optic nerve also appeared sound, and could be traced an appreciable distance within the choroid, until lost in the substance of the tumour, where it should have become expanded. The hyaloid membrane and vitreous body seemed to have given origin to the disease. The preparation now in the museum is marked 1669[58].

Fungoid disease of globe.

As a contrast to the foregoing, and in corroboration of the decision therein acted upon, I add the following case of fungus hæmatodes. It was indistinguishable in the earliest stage from scrofulous tubercle, and was treated without operation afterwards, in consideration of the unfavorable statistical results of extirpation in these cases, and in view of the probability of cerebral affection already initiated, as evinced by the occurrence of a fit.

Mary Ann B—, aged $2\frac{1}{2}$ years, an only child, was brought by her mother, living in Bermondsey, at the latter part of the year 1856, to Guy's. Fifteen months previously, at the age of a year and a quarter, a difference between the eyes, and a squint in the right had been noticed. When brought under observation the right eye was amaurotic, but the refracting media were transparent, and through them a fawn-coloured growth was seen springing from the fundus of the globe; its surface presented two or three nodules divided by sulci in which minute blood-vessels were ramifying. It gradually increased in bulk, and advanced forwards, causing progressive absorption of the vitreous humour, then pushing the lens against the iris, and then protruding the latter within the aqueous chamber. Notwithstanding the continued growth of the tumour, the child's health improved, nor did she suffer pain until about the 1st of January, 1857, when she began to complain much of her head; shortly after she was reported to have had a fit, lasting five minutes, during which she was convulsed and insensible. The globe now increased in size, and the conjunctiva became more vascular, and the lids œdematous. The condition on January 27th, 1857, was as follows:

The patient was delicate and pallid, though moderately plump and well nourished; the affected globe was larger than natural; the sclerotic was entire, but thinned, and many of its vessels, with those of the conjunctiva, were enlarged and of a dark purple colour; the pupil was dilated, and occupied by an opaque lens of dirty yellow hue, upon the surface of which some effused blood was seen; the anterior chamber was virtually obliterated by the pressure of the opaque lens and iris;

no glandular enlargement was discoverable in the neighbourhood. The child was said to be prevented from sleeping by pain.

The complaint made steady progress; and at the end of March the globe protruded from the orbit, being three or four times its natural size: the cornea now became opaque; the child was constantly moaning; refused medicine, but took food fairly.

In April, occasional oozing of blood took place, and the discharge from the tumour became very offensive; its bulk continued to increase, and it presented a diseased mass, amid which neither the cornea nor any other original texture was distinguishable.

The poor little patient lingered until July. A post-mortem examination would have been desirable to reveal the state of the brain and other viscera; but unfortunately, the mother living some distance from the hospital, this was not obtained.

Better, we might well consider, in a case like this, were death some months earlier, even accelerated by removal of the local disease; than after so long a period of protracted misery, with loathsome disfigurement, insupportable fetor, and continued suffering. But we may not thus judge; and to prolong life to the utmost span is the acknowledged first duty of the practitioner.

Plate V.

Illustrating Mr. France's cases of organic disease of the globe of the eye.

Fig.

1. Refers to the case of Thomas B—, at p. 197.

   a. The optic nerve appearing almost in the axis of the globe, apparently from unequal shrinking of the sclerotic.

2. Refers to the case of Elizabeth M—, at page 193.

   a. Optic nerve.

3. Refers to the case of Emily C—, at p. 196.

Plate V.

Fig. 1.

a.

Fig. 2.

a.

Fig. 3.

W Hurst del. et lith.

W West Imp. Hatton Garden

CASES

OF

IDIOPATHIC FATTY DEGENERATION.

WITH REMARKS ON ARCUS SENILIS.

By SAMUEL WILKS, M.D.

This designation is given to a class of cases in which an excessive anæmia and debility are the peculiar phenomena observed during life, and a fatty degeneration of all parts of the body, but especially of the heart, the most remarkable appearance found after death. It will be remembered that Dr. Addison, in his treatise on diseases of the supra-renal capsules, remarks, that it was while searching for a cause in explanation of death in certain forms of anæmia, that he discovered the malady which is now known by his name: and it will excite no surprise that the scientific physician, and he who is especially conversant with the physical signs of disease, should, in our present advancing knowledge of morbid anatomy, feel a peculiar interest in those fatal maladies which have hitherto baffled all attempts to locate them in any particular part of the body; seeing that, although it were but recently that such expressions as exhaustion, debility, and atrophy were employed as sufficiently intelligible to account for death where these symptoms were the only prominent marks of disease, a more careful research and rigid deduction of facts have of late years succeeded in tracing such indefinite diseases to their real seat, or even, where failing this object, as in the class of fevers, so correct a knowledge of their history, symptoms, consequences, &c., has been obtained, that they have become as defined and own as determinate a cause as the more local affections. There do, however, yet remain certain fatal maladies which have not yet owned any *fons et origo,* and have hitherto baffled

the pathologist. Among these are the cases which we are about to relate, distinguished by a general fatty degeneration of the tissues of the body, and which we have called idiopathic, in order to disconnect them from those instances of fatty change of organs which are found to accompany so many other diseases of the ordinary class. Indeed, a fatty degeneration is one of the most common morbid appearances met with on the post-mortem table; so frequent indeed is it that it may be stated as a rule that in most cases where patients have been bedridden for any length of time with various chronic disorders, a fatty change in one or another viscus will present itself after death. Although it is possible that in all cases of fatty degeneration, the immediate cause of the change may be the same, yet if there be in such cases any primary manifest disorder preceding it, they are precluded from our present observations. We exclude also all cases which can come under the term senile fatty degeneration, although they much resemble those of which we speak. Nor do we allude to another class of cases which approach them still nearer, where intemperance appears to be the prime mover; cases in which, although an acute pneumonia, an accident, or a delirium tremens may have been the immediate cause of death, the principal morbid appearance has been a general fatty degeneration of the organs; which cases, indeed, resemble them still more closely should death have occurred from mere exhaustion, or from what might be called a chronic delirium tremens, without any acute disease. In spirit-drinkers a mere fatty change, in the tissues is met with, accompanied by a general wasting of the body. In beer-drinkers a similar change occurs, with the addition of interstitial or enveloping fat. In the cases before us no such evident causes have obtained, and the only appreciable or probable ones were hæmorrhages, diarrhœa, or miasmata; and a question arose during the observation of each case, and now recurs, whether these or similar influences may have produced such a debility of the system, of which this general change of all the tissues was the result. As in the cases below given, very similar symptoms existed in several of them, we have felt disposed sometimes to consider that hæmorrhages, diarrhœa, &c., will produce an anæmia which, if long protracted, will prove fatal by a fatty degeneration; and, in the same way,

miasmatic or other influences which dispose to anæmia,—that is, that anæmia, however produced, will, if not cured, terminate by this process. The only objection we at present feel is, whether these discharges of which we speak may not have been the accompaniments or consequences of the organic changes rather than the cause. But we hope, by a further collection of cases, to gain some more positive result on this matter. With respect to the effect of marsh miasmata, we would suggest to any medical man resident in an aguish district the importance of ascertaining what are the visceral changes in those persons who occasionally appear to succumb to the long-continued influence of the poison upon them, with or without distinct attacks of intermittent fever.

It may also be a question whether great depressions of mind, acting on the nervous system and the body at large, may not set up the same or an analogous process; and, in illustration, may be mentioned a remarkable instance, related by Sir H. Marsh, of a young lady who, having accidentally poisoned her father, fell into a state of prostration, extreme anæmia, and finally had a general dropsy, before death relieved her of the suffering which was induced by mental anguish.[1]

The following seven cases will afford examples of this remarkable fatal anæmia and fatty degeneration. They are the more striking, seeing that the subjects of it were comparatively young. It will be observed that a fatty degeneration of the heart is the most marked and important occurrence, and that the liver and other organs in some cases were only moderately fatty. Also, that there was no excess of fat in other parts, and that, at the same time, the patients were not wasted.

Case I.—Mary B—, æt. 31, was admitted under Dr. Hughes, in March, 1855. She had been living as servant at

[1] We would remind the reader that there is a form of disease of the lymphatic system, sometimes associated with enlargement of the spleen and liver, productive of a similar set of symptoms, and which may slowly kill without marked derangement of any one organ, and where, if no external enlargement of the glands occur, the diagnosis is very difficult. Some such examples are mentioned in the last volume of 'Guy's Hospital Reports,' and we have witnessed two similar ones since their publication.

Rotherhithe, and since her marriage, about a year before, had had much domestic trouble. During the whole of this latter period her health had been failing, and, gaining no relief, she came to the hospital. She was then in an extreme state of anæmia, so that a loss of blood at once suggested itself as the cause; but she denied having had any hæmorrhage, diarrhœa, or any other symptoms excepting those dependent upon her gradual increasing debility. The catamenia were also regular. Her pallor was so great that it at once arrested the attention of every visitor to the ward. There was no increase of white globules in the blood. She grew feebler and feebler until her death, a fortnight after admission. During this time she had frequent vomiting and diarrhœa. The pulse was quick, and an anæmic cardiac murmur existed. It was afterwards learned that her mind at one time had been affected.

The post-mortem examination showed the body spare, but not wasted. The brain was healthy, but having a few small spots of ecchymosis in parts, and the base of the skull was very thin in parts. The heart presented an extreme degree of fatty degeneration. The mitral columns, especially, had about half of their substance occupied by the usual transverse lines of fatty matter. There was no coagulum in the heart or vessels, only a little watery blood escaping from them when cut. They presented no excess of white corpuscles. There was a considerable layer of fat in integument of abdomen, and also in mesentery, omentum, &c. The liver was very fatty, although not in an extreme degree, for, on microscopic examination, it was seen that the circumference only of the lobules had undergone this change, and not the whole tissue. Kidneys appeared healthy to the eye, but tubules found to contain much fat. Spleen healthy and moderate size. No trace of arcus senilis.

Case II.—Martha D—, æt. 28, was admitted a patient of Dr. Oldham, on November 13th, 1856. She lived in Lambeth, was a woman who had always had delicate health, and had suffered much domestic trouble. She had also had one or two miscarriages, with much hæmorrhage. A few days before admission, being about three months pregnant, she was seized with flooding; this continuing uncontrollable, she came to the

hospital; abortion occurred, and the hæmorrhage gradually ceased. She was seen to be a well-developed woman, though now rather spare, and remarkably pale and anæmic. Nourishment of all kinds was given her, but she daily got lower, without any marked symptoms of derangement of any particular organ, and at last died, the legs having lately become slightly œdematous.

Upon post-mortem examination, December 9th, the body was seen to be tolerably robust, but very pale, and the ankles œdematous. The internal organs were all remarkably pallid and bloodless. Neither the heart nor the vessels contained any coagulum, and scarcely any blood. The lungs were white, and exuded a little serum, but were otherwise healthy. The heart contained the ordinary amount of fat externally, but the muscular tissue had undergone an extreme fatty degeneration; the mitral columns, as usual, showing the feathery markings in the greatest degree. The right ventricle was but slightly affected, and no white lines or dots could be seen by the naked eye. The valves were healthy. The liver was white and very fatty. The spleen was very large, weighing one pound; but healthy. Kidneys very pale; appeared otherwise healthy to the naked eye. The microscope showed, however, the secreting cells to be filled with fatty molecules, and in many tubes little else could be discerned than similar granules. The uterus had not yet recovered its normal size, and its internal surface was covered by a dark-coloured, sloughy, shaggy membrane. There was no trace of arcus senilis. The semilunar ganglion was healthy.

Case III.—William C—, æt. 16, was admitted under Dr. Addison's care, in January, 1856. His only symptoms were those resulting from extreme debility; he being very pale, anæmic, and resembling, in fact, a chlorotic girl. He had, however, a slightly yellow tinge, and he was not thin, though spare. He was an errand boy in the City, and stated that he had not been well for three years, and had often suffered from bleeding at the nose, sometimes to a great extent, and lately had had diarrhœa. He had resided nowhere but in the City, and knew nothing of ague. Dr. Addison carefully and repeatedly examined him, but could find no local disease.

While in the hospital he had, on two or three occasions, violent epistaxis; he often had sickness, and sometimes diarrhœa. He was so weak that he was obliged to keep his bed; but in April he began rapidly to improve, and left the hospital. He went to Berkhampstead, and was for a time better, but soon the diarrhœa and epistaxis returned, and he came back to the hospital in August. He was then as bad as ever, presenting a remarkably pallid aspect, as seen in anæmia, combined with a yellowish aspect which suggested a miasmatic influence as its cause. His skin was soft, and he was not wasted as in phthisis. Again, physical examination failed to detect any disease in the chest or abdomen. He kept his bed, and daily sank, at times having diarrhœa and sickness, but no cough, and no more epistaxis. The legs at last became slightly œdematous.

Upon post-mortem examination, the body was seen to be pale, as during life; wasted, but not to a great degree; and skin smooth and supple. There was no appearance of puberty, and it would seem that the boy was two or three years younger than he stated himself to be. Lungs healthy; no tubercles. Heart in a most extreme degree of fatty degeneration; the whole of the left ventricle was covered by the usual white zigzag lines, not the smallest part being found unoccupied by this fatty change; the right ventricle was also similarly affected, though in a less degree; the auricles were healthy. The heart was empty, excepting the right auricle, which contained a small quantity of pale fluid blood. This showed no excess of white corpuscles. The large intestines contained numerous cicatrices of ulcers, or ulcers nearly healed, and a little recent diphtheritic inflammatory exudation in parts. Liver pale and fatty, but not to an extreme degree. Kidneys appeared healthy to the naked eye, but microscope showed much fat in the form of granules in the tubes and secreting cells. The lymphatic glands were healthy. There was no appearance of arcus senilis.

Case iv.—Charles P—, æt. 52, admitted under Dr. Barlow's care, on April 16th, 1856. He was a tanner, living at Guildford. When young had his nose destroyed by lupus; never had syphilis; habits temperate; never had ague. During the

six months before admission he had not lived so well as he should have liked, and had experienced severe rheumatic pains, and had often felt disposed to faint upon any unusual exertion. Sometimes, also, having great dyspnœa and headache. These symptoms continued until admission. He was extremely anæmic, and suffering all the consequences of the attendant debility; the urine was not albuminous; towards night the ankles became swollen. After a month's time he was so weak that he was obliged to take to his bed, and from this time he grew weaker and weaker. He was repeatedly examined, but no disease was discoverable, the only symptoms being the remarkable pallor and debility. A few days before death he lay in a half-conscious state, and in the night he was delirious.

Upon post-mortem examination, the body was seen to be spare, but not extremely wasted; and pale, as if death had taken place from hæmorrhage. Little serum in chest. Lungs pale, healthy, œdematous. Increased fluid in pericardium. The heart contained a clot on the right side; the external fat was small; the muscular tissue had undergone a most extreme degree of fatty degeneration, presenting the usual mottled appearance to the naked eye. Liver very fatty. Spleen healthy; usual size. Kidneys pale, and although no structural disease visible to the naked eye, they were found, by microscopic examination, to contain a considerable amount of fat. No arcus senilis.

Case v.—Mary Ann H—, æt. 31, admitted under Dr. Addison's care on 30th May, 1853. She had been living lately at Wandsworth, and before at Lincoln. Never had ague. On admission she was in an extreme state of anæmia, and she stated that she was very ill during the last few weeks of pregnancy, having had constant diarrhœa, with passage of blood, and also vomiting, with occasional blood. She also had had violent epistaxis. She had now been confined three weeks, but was too ill to suckle, the symptoms growing worse. Her prostration was extreme, being too great for her to sit up in bed; she was quite blanched, and presented an ordinary chlorotic appearance. The heart was irregular, and there was a systolic anæmic murmur over valves. Urine not albuminous. Diarrhœa continued, with occasional sickness, but no blood.

No disease was discoverable in any organ. She gradually sank, without any assignable cause, except debility, and died a month after admission.

Upon post-mortem examination, the body was seen to be extremely pale, and the organs white and bloodless. Lungs healthy. Heart in most extreme state of fatty degeneration. The muscular tissue covered with the ordinary white lines. The liver was extremely fatty. Spleen and supra-renal capsules healthy. Kidneys pale, and found, by microscope, to have their tubules and cells filled with granules and globules of fat. Stomach and intestines presented a healthy appearance; no trace of ulceration in any part of their course. No arcus senilis.

Case vi.—Eliza T—, æt. 50, had been an inmate of the lunatic ward for thirteen years. She had enjoyed tolerable health until the last few months of her life, when she gradually fell into a state of great debility. This increased week by week, until her exhaustion was such that she was unable to rise from her bed. Her only symptoms were those connected with this remarkable feebleness, repeated examinations failing to discover any signs of disease in the chest or abdomen. She had, however, repeated vomitings. She was thin but not wasted, and her appearance generally denoted anæmia or a bloodlessness. She had no hæmorrhage or diarrhœa. After death the body was found to contain some fat internally, as well as some beneath the integument. The brain was very pale; the lungs were œdematous. The heart contained a very small, pale, loose clot on the right side, together with a small quantity of limpid, watery blood. The muscular tissue was in an extreme state of fatty degeneration. There was a slight excess of superficial fat; but the great change was in the muscle itself, and this especially in the left ventricle. The inner surface presented the markings in an extreme degree, and these penetrated the walls to about half its thickness. A few similar lines and specks were seen on the right ventricle, particularly on the septum. None was seen in the auricles. Coronary vessels were healthy. Liver pale, with excess of fat. Kidneys in a similar condition. Semilunar ganglion healthy. No arcùs senilis.

Case VII.—George E—, æt. 30, was admitted under Dr. Hughes's care in April, 1854. He worked in the London Docks, and resided in Newington, where he had lived all his life. He stated that, about four months before, he found himself gradually becoming weak, but without any appreciable cause, and two weeks before he passed a large quantity of blood by stool. On admission he was in an extremely debilitated condition: he was so weak as to be compelled to keep his bed. He was not, however, wasted, although spare; and his complexion was rather of a yellowish-white or sallow hue than merely pallid. The ankles were slightly œdematous; if he moved he found his breath short and his heart flutter. He was repeatedly examined in order to discover any organic change, but in vain; and he gradually sank, and died from exhaustion three weeks after his admission. After death all the organs were carefully examined; but no disease was discoverable, except an extreme fatty degeneration of all the viscera. The heart was seen to present the usual appearance of the white striæ of fat in the ventricles. The liver was pale and fatty. The kidneys also were very pale, and contained many fat-granules in the tubules. There was no ulceration in the intestines. The spleen was rather larger than usual, weighing eleven ounces; but was healthy.

An aguish influence was suspected in this case, from a very frequent heat of skin manifested in the patient at different times.

We will append two other cases, which are, apparently, examples of this form of disease, and where no other cause was traceable than miasmatic influence. One was fatal; but, unfortunately, no post-mortem examination could be obtained.

Case VIII.—Patrick R—, æt. 40, was under Dr. Addison's care in 1854. He was a seaman, and employed mostly in the American coasting trade. He had had fever and ague, and for the last three years had suffered from diarrhœa, which appeared to be of a dysenteric character. He had been in the New York Hospital for some months, and whilst there he said the doctors were in the habit of feeling his enlarged spleen. Being no better he was sent home, and came to Guy's. When admitted he was seen to be a large man, and in tolerable

condition, but remarkably pallid and weak. He was so white that hæmorrhage naturally was suggested as the cause of the anæmia, and he was so debilitated that he was obliged to keep his bed. He was examined repeatedly in order to discover any disease; but none was to be found, nor had he any other symptoms than those attendant upon his extreme prostration. The diarrhœa had ceased, the spleen was not to be felt, the urine was healthy, and the blood contained no excess of white blood-corpuscles. He gradually sank, and died at the end of a month. Being an Irishman, no post-mortem inspection was permitted; but, from the careful and repeated manner in which he was examined during life, and the absence of all symptoms denoting visceral disease, there can be little doubt that a similar change had occurred in all the organs, as was so well marked in the preceding cases.

Case ix.—Elizabeth J—, æt. 27, had lived at Plumstead all her life. She had never had ague, although much exposed to its influences; but had had at times some paroxysmal symptoms, which seemed to point to miasm as their cause. Having been in a very debilitated and anæmic state for several months, she was admitted into the hospital in 1854. She was a stout woman and inclined to be fat; but remarkably feeble and extremely pallid. She thus had the general appearance of a patient with chlorosis. The catamenia were regular, she had no cough or chest-symptoms, and the spleen could only be doubtfully felt below the ribs. In spite of all treatment the anæmia continued, without wasting; and she was obliged to keep her bed from excessive debility. After being in the hospital nearly four months, she left in rather a weaker condition than when she entered.

The following case is given as an exemplification of the very similar condition of fatty degeneration produced by the excessive use of alcohol:

Case x.—Henry T—, æt. 47, under Dr. Rees in January, 1854. He had been a professional man by occupation; but had led a very dissipated life, and had been much addicted to spirits. In consequence he had suffered several times from delirium tremens, and during the last few months of his life

had sunk into an extremely feeble condition. When admitted into the hospital he was scarcely in a conscious state, which seemed to arise from his excessive debility. He was too weak to raise himself in bed; his skin was pale, his flesh was soft and flabby, and although spare was not emaciated. He looked twenty years older than his real age. He never rallied; but died in a few days.

On post-mortem examination there was still seen a considerable amount of fat beneath the integument and among the abdominal viscera. The voluntary muscles were pale, and in several places, as in the pectoral, had undergone a fatty degeneration. The heart contained a considerable amount of fat on its front aspect, and the muscular tissue of the left ventricle had undergone a great amount of fatty degeneration. The liver was pale and very fatty. Kidneys pale, and tubuli contained much fat in the secreting cells and tubes.

Arcus senilis and fatty heart.—The total absence of arcus senilis in these cases leads us to make some general observations on this pathological condition of the cornea, particularly as great importance has of late been attached to its presence as being indicative of a general fatty degeneration of the body, and more particularly of the heart. The researches of Canton have shown that this well-known appearance of the eye is due to a fatty change in the cornea, and generally accompanies similar changes in other parts of the body; and he seems, therefore, to prefer calling it by its true scientific pathological term rather than by its more common designation. Although we believe that the views of this observer are correct with respect to the true nature of the arcus as well as to its general signification, yet our own experience would not cause us to attach that importance to its presence or absence which that gentleman does, or at least to make us regard it as indicative of any peculiar changes within the body. Our own experience, in short, leads us to prefer the term arcus senilis as truly expressive of a condition of the eye accompanying concomitant senile changes in the body generally; the term still being applicable if old age should be premature. Our principal reasons for attaching no greater importance to it are these: that in cases like those above related, where some cause is in

operation to produce a fatty degeneration of the heart and other organs, independent of that which exists in the after period of life, no such changes in the cornea are found. Also that in most cases where a fatty heart is the accompaniment of valvular disease in young persons, it is absent. Again, its occasional absence in old people who have fatty hearts; and its very frequent presence in old people where various senile changes are found, but which are not of a marked fatty kind. With regard to the last, we mean to say that in advancing age, although the alteration in the tissues is towards the production of fat, and probably in all cases more or less of this change occurs, yet that in some instances we find those changes to be principally of the kind which is styled fibroid and the heart in a state of fibroid degeneration. This is shown in old people by the mitral fleshy columns being converted into a tough fibre-tissue at the part where connected with the valvular cords, as well as the neighbouring trabeculæ being changed in like manner. Such hearts, we say, are constantly found in old people where there is no, or but slight, fatty change in the organ, but yet a well-marked arcus senilis exists.

To show the facts on which these statements are made we have looked through our post-mortem records for the last two years, and have extracted the following cases. We may here remark that since the observations of Canton, care has been taken to note the presence or absence of arcus senilis on all bodies submitted to post-mortem examination.

Cases of Fatty Heart with no Arcus senilis, or but slightly present.

There are first the seven cases already related in full. Also—

Woman, æt. 50. Cirrhosis of liver; granular degeneration of kidneys; left ventricle streaked by lines of fat, and right covered with it. No arcus.

Woman, æt. 38. Cancer of œsophagus; heart much degenerated, and microscope showed no single fibre that had not undergone change. No arcus.

Woman, æt. 63. Gangrene of leg; all organs fatty, in-

cluding heart, whose interior was covered with white lines of fat. Arcus partial.

Man, æt. 56. Cirrhosis of liver; chronic peritonitis; fatty heart, with the usual zigzag lines on left ventricle. Arcus very slight.

Man, æt. 66. Pyæmia, from injury to foot; heart fatty. No arcus.

Woman, æt. 57. Granular kidney, &c.; extreme fatty degeneration, destroying great part of wall of right ventricle. No arcus.

Man, æt. 27. Acute pneumonic phthisis; all organs very fatty, including heart. No arcus.

Several others could be brought forward showing that in the various fatty degenerations which occur above the middle period of life, an arcus senilis is by no means invariably present. When the fatty change is connected with disease of the valves, and arises from some primary alteration in the organ itself, it is quite the exception to meet with an arcus.

A child, æt. 13, died with old valvular disease, and the muscular tissue of the heart was found to have undergone an extreme fatty degeneration. No arcus.

A man, æt. 37. Old disease of heart, and very fatty muscular tissue. No arcus senilis.

A man, æt. 31, with valvular disease, and whole of left ventricle covered with white lines of fat. No arcus.

A man, æt. 55, died with heart-disease, and muscular tissue in same condition as the last. No arcus.

A woman, æt. 39, with long-standing valvular disease of heart, and great fatty degeneration of muscular tissue. No arcus.

A man, æt. 52. Valvular disease of heart, and great fatty degeneration of left ventricle. No arcus.

A man, æt. 54, with disease of heart, and considerable fatty change in muscular walls. No arcus.

A considerable number of similar cases could be added; the last being that of a woman, æt. 22, with a most extensive fatty degeneration of the muscles of the heart.

Cases of Arcus senilis with no Fatty Degeneration of Heart.

We have also several cases where there was a marked arcus senilis in persons of advanced age, but no fatty degeneration of the heart. The arcus no doubt accompanied various senile changes in the body, and amongst others, those of the heart; but in this organ they were often, as before said, those of a fibroid condition, rather than a fatty, although undoubtedly there is, as a rule, in old persons, a tendency to the increase of the superficial fat, to the detriment of the muscular wall of the right ventricle beneath.

Man, æt. 60. Pyæmia; arcus senilis; heart healthy.

Man, æt. 54. Lithotomy; commencing arcus; fibroid change in heart.

Man, æt. 67. Hernia; arcus present; slight fibroid change.

Man, æt. 62. Carcinoma of stomach; slight arcus; heart as above.

Man, æt. 51. Stricture; marked arcus; heart healthy.

Man, æt. 49. Stricture; slight arcus, but marked; heart healthy.

Man, æt. 63. Cirrhosis of liver; slight arcus; heart healthy.

Woman, æt. 72. Hernia; arcus moderate; heart not fatty.

Woman, æt. 60. Cirrhosis of liver; commencing arcus; heart healthy.

Man, æt. 65. Cancer of stomach; marked arcus; heart healthy.

Man, æt. 71. Enlarged prostate; marked arcus; fibroid degeneration of heart.

Man, æt. 56. Cancer of intestine; marked arcus; slight increase of fat on heart.

Woman, æt. 70. Fractured thigh; arcus present; fibroid change in heart, and slight increase of fat.

Man, æt. 41. Diseased heart, but no fatty degeneration; arcus present.

Woman, æt. 70. Ovarian disease and peritonitis; arcus present; no fatty heart.

As before said, we by no means dispute that arcus senilis accompanies a fatty heart, since both are the concomitants of old age—and we may state that we could bring forward several

cases to corroborate the statement; but of an arcus being associated with a fatty degeneration of the heart in a youmg subject, we have only one case in point, and therefore must consider it altogether exceptional.

A man, æt. 36, died with a long-standing disease of the heart, and the muscular tissue had become very fatty. The other viscera in the body had also undergone a like degeneration. There was a slight arcus senilis.

Where the arcus does exist with fatty heart in old people, the change is not so much that of the muscle itself, as of the external fat increasing at the expense of the wall of the right ventricle.

Man, æt. 65. Hernia; arcus; external fatty degeneration.

Man, æt. 65. Carcinoma; all organs fatty; marked arcus; heart, much external fat.

Man, æt. 67. Carcinoma; arcus; much fat outside heart.

Woman, æt. 65. Hernia; arcus marked; much external fat on heart.

Man, æt. 67. Stricture; marked arcus; same condition of heart.

Woman, æt. 73. Hernia; marked arcus; much fat on surface of heart.

Woman, æt. 81. Very slight arcus; heart covered with fat, and destroying much of wall of right ventricle.

From these observations, we necessarily draw the conclusion before given, that the arcus is a disease of old age, and accompanies other senile changes which are generally of a fatty kind, and also that it may occasionally be present at an earlier period of life, associated with other evidences in the body of a premature decay. Also, that the arcus may be present in old age, where the various degenerations in the heart, blood-vessels, &c., are not of a markedly fatty kind; and even occasionally, that the opposite fact may be met with—the absence of arcus in old persons who have the usual degenerative processes occurring throughout the system, and which partake of the adipose variety. Again, if from various circumstances, unaccompanied by age, a fatty degeneration of the heart and other viscera should occur, no arcus will be present. We, therefore, are disposed, until more extended observations are

made on this subject, to cling to the old name of arcus senilis, or gerontoxolon, as the most correct, and therefore the most scientific term.

We think, however, it is highly probable that a confusion in the expression *fatty heart* may lead to these differences of opinion, and that two very different pathological conditions have been included under one name, and that the arcus may be connected with one of them, and not with the other; one being a change concomitant with age, or with those circumstances which bring about those alterations in the body known as senile, while the other is an altogether primary or idiopathic affection. We will, therefore, offer a few further remarks upon this subject.

Fatty heart.—Not only have, we believe, two very different pathological conditions been often confounded, but very different degrees of the same process been placed together as affording examples of this change. Thus we have seen two hearts put in the same category as fatty, in which one has had this alteration in tissue so marked as to be at once recognised by the naked eye, while the other has required a thorough examination by the microscope in order to discover a few fat-granules in some isolated fibrillæ. The most important matter, however, is that referring to difference of kind—to the distinction so ably made by Dr. Quain, but not yet sufficiently understood. The difference is between a growth of the natural fat of the heart destroying the adjacent muscle, and an interstitial change in the muscle of those parts of the heart where no fat naturally exists. The one has reference more especially to the right, and the other to the left side of the heart, the two being altogether different processes.

And here may lie the explanation of our opinion respecting the absence of arcus in some cases, and its presence in others. That it accompanies the gradual increase of fat on the right side of the heart and its encroachments upon the wall of the right ventricle beneath, while it has no connection with those idiopathic changes in the muscular fibre occurring in earlier life, and dependent on causes altogether apart from age. Even if, as before said, an arcus should accompany a fatty heart in a comparatively young subject, the alteration in the heart is

of the senile kind, that is, an increase of the external fat upon the heart, until the whole muscular surface is hidden, and part of the wall is eaten away by the new tissue; and should the muscle in the left ventricle be affected, it is generally only by the change of the fibres near the superficial fat of the apex. In the fatty heart depending upon altogether different causes, there is not necessarily any increase of the external natural fat, and often the contrary; but the muscular tissue itself, in its thickest parts, has degenerated. Thus, on the mitral fleshy columns especially, are seen a number of striæ or zigzag lines, producing a beautiful feathery appearance in the interior of the ventricle. This is the form which has only of late years been recognised, and for much of the knowledge of which we are indebted to Dr. Quain—the other form of degeneration by excess or encroachment of natural fat has always been known. The distinction cannot, we believe, be too strongly enforced, since not only is it an anatomical, but, we believe, a pathological one. This does not, however, prevent the two occurring together, as is sometimes seen. The most marked cases, however, of one form are constantly occurring without any approach to the other. Thus, in the cases above related at full, where this change occurred in the muscular tissue to a most extreme degree, the subjects of it were spare, and the fat upon the heart was no more than in other persons; while, on the other hand, we constantly meet with the opposite fact, of an organ covered with fat, and yet no great degeneration of the tissue; and this we have noticed in the most marked manner in our dissecting room, especially in old subjects which have come from the workhouses, and have got into this condition from indolence or some peculiar diet: one instance we lately saw of a woman whose pectoral and other muscles were so changed into fat, that it was quite unfit for anatomical purposes, in whom the heart was so enveloped in fat that the anterior muscular wall was quite destroyed, and yet in remote parts of the organ no fatty change had occurred. In this case there was a slight arcus senilis. Our conclusion then is, that the arcus senilis is accompanied by this latter form of fatty degeneration, and has no connection with the other; and with this distinction our observations come closer to those of Mr. Canton. As, however, that gentleman has drawn, we believe, no such

distinction, but spoken in general terms of fatty heart, the remarks before made are necessitated. We would, however, prefer not offering any more decided opinion than we have done until a great many more observations have been made. We must also allude to the want of care in some writers in the use of the expression fatty heart, not only as inclusive of these two very different kinds, but of the most extreme degrees of the change when present.

This subject of fatty heart and arcus senilis has been much discussed, with reference to sudden death, and the cause of fatal accidents from the administration of chloroform. It therefore suggests a remark, although foreign to our original purpose in relating the above cases, since much *à priori* reasoning on these subjects has taken place which we believe is not borne out by facts. In many of the cases we have examined of sudden death, the heart has not been fatty; and, on the other hand, fatty hearts are every week met with in persons who have died a lingering death. Also as regards chloroform in the two fatal cases which have occurred at Guy's; in one, a young man, the heart was perfectly healthy, while in the other the organ was that of a person in rather advanced life, with a slight increase of fat on the right side. Again, during the past year we have had two or three cases of persons who have died a week or two after operations in which chloroform was administered, and in whom extensive fatty disease of the heart existed. Indeed, we still hold the opinion expressed three years ago in speaking of one of the above fatal cases of chloroform.[1] "In the heart of this woman, the naked eye discovered none of the ordinary appearances of fatty degeneration, and it was only by a careful examination that a few fibrillæ in the right ventricle were found to have become granular. This fact leads us to make a further remark on the subject of the connection of fatty heart and sudden death. We may state, that our experience shows that the two are by no means invariably associated. The majority of fatty hearts we have seen, occurred in those persons who had been long bedridden, and died slowly, and in whom this condition of heart was only part of a like fatty degeneration in all the other tissues. On the other hand, in cases of sudden death, the heart is by no

[1] 'Association Medical Journal,' Dec. 22d, 1854.

means invariably found fatty; and if so, the change is not extreme. Lately, when an old man died suddenly, and a fatty heart was suspected, the tissue of this organ had undergone a most remarkable *fibrous* change; and only a few days before the chloroform case, a man died suddenly in his bed during the convalescence of fever, and not the slightest morbid change could be detected in the cardiac tissues. We have seen three or four such cases as this, and the tissue was flabby and weak, and no doubt in an unhealthy condition, although no marked morbid change was discoverable. We have made these remarks, because we have observed sometimes a disappointment experienced when a fatty heart has not been found in such cases, as though this morbid condition was the only one which the organ could undergo. That a fatty degeneration is a very common change, and one which is often the cause of a sudden cessation of the heart's action, there can be no doubt; but that the former fact and the latter event are invariably associated has not yet been proved."

ON

THE CAUSES OF DEATH

AFTER

LITHOTOMY.

By THOMAS BRYANT.

A THOUGHTFUL man having failed in any of the ordinary transactions of life, upon which he has bestowed much labour and great attention, quietly sits down, and patiently searches out for the causes of his failure; with the hope, that, on the repetition of his attempt, he may steer clear of the difficulties which previously had interfered with his success. With similar feelings the surgeon carries out this same principle; and with the view of rendering less fatal the operation of lithotomy, I have been induced to search out for the causes of its failure; and thus, having carefully compiled from the records of Guy's Hospital materials upon which some definite conclusions may be drawn, the hope may be expressed that the attempt will not be fruitless, and that some of the causes of death may in future be avoided.

From the *clinical records* of the hospital I have been enabled to collect 176 cases of lithotomy; and from the *notes of the necroscopic examinations*, together with those from the above which terminated in death, 40 fatal cases have been collated. The careful analysis of these materials is given in the following pages, and the first point which asks for our investigation is the influence of age upon the fatality of the operation.

Table I.

Showing the ages at which the operation was performed and its fatality at the different periods.

			Number of cases.		Per cent.		Cases.		Per cent. fatal.	
5 years of age and under			55	or	31·25,	of which	3	or	5·45	93 cases, of which 3, or 3·22, were fatal.
6 years	to	10 inclusive	38	„	21·59,	„	–		none	
11 „	20 „		36	„	20·45,	„	4	„	11·	
21 „	30 „		10	„	5·68,	„	–		none	
31 „	40 „		6	„	3·40,	„	–		„	
41 „	50 „		7	„	3·97,	„	4	„	57·14	31 cases, of which 17, or 58·06, were fatal.
51 „	60 „		18	„	10·20,	„	10	„	55·55	
61 „	70 „		5	„	2·84,	„	3	„	60·	
71 „	80 „		1	„	·56, which was fatal.					
			176				25 cases, or 14·20 per cent., were fatal.			

From the above table it is fair to conclude that lithotomy very early in life, that is, during the first five years, is much more fatal than during the next quinquennial period, the powers of the child being then sufficient to counteract the depressing tendency of an operation, with the accompanying loss of blood and shock to the system. From ten years of age to twenty, lithotomy is more fatal than in the previous decennial period: the bladder with its prostate and neck having then become a more important organ, resents an injury such as an operation, and the system sympathising with its development experiences a like depression; greater fatality would then naturally be expected, and the above table demonstrates the fact. As time progresses, and man in his maturity is enabled to resist disease, and the effects of injury or surgical operations, lithotomy diminishes in its frequency, and also in its fatal tendency. But as age creeps on, and the powers of life begin to fail, the operation for stone becomes more serious, and its fatality much greater, 58·06 per cent. of the cases operated upon proving fatal.

Table II.

Analysis of 40 *fatal cases.*

				Number of cases.			
5 years of age and under.				4	or	10	per cent.
6 years, and under 10 inclusive ...				2	„	5	„
11 „	„	20	„	... 6	„	15	„
21 „	„	30	„	... 2	„	5	„
31 „	„	40	„	... 2	„	5	„
41 „	„	50	„	... 7	„	17·5	„
51 „	„	60	„	...11	„	27·5	„
61 „	„	70	„	... 4	„	10	„
71 „	„	80	„	... 1	„	2·5	„

57·5 per cent.

The age of one adult is not mentioned.

The conclusions which may fairly be drawn from the above table, well confirm those deduced from the consideration of the former one.

It will be seen that 10 per cent. of the whole number of fatal cases occurred during the first five years of life, and that during the second the fatality was diminished exactly one half.

During the next decennial period, when the genito-urinary organs become by their rapid development an important system, the fatality is much larger, as shown by the 15 per cent.

During manhood, when the powers of life are at their height, although lithotomy then becomes a somewhat rare operation, the fatality again falls, and but 5 per cent. represents the fatal number.

As age progresses, and the powers of resistance against surgical interference become less, the fatality proportionately increases, and more than half the fatal cases are above forty-one years of age.

Conclusions.

1. That lithotomy is at least twice as fatal during the first five years of life, as it is during the second.

2. That during puberty, or between 11 and 20 years of age, it is more fatal than during any earlier period.

3. That after 20 and up to 40 years of age it is comparatively of small fatality.

4. That 30 per cent. of the fatal cases are during the first twenty years of life.

5. That 10 per cent. are during the second twenty years of life.

6. That 60 per cent. are above 40 years of age.

7. That 14·20 per cent. of the cases operated upon prove fatal.

Upon the Causes of Death.

I. *Hæmorrhage as a cause of death.*

Under this head must be enumerated six of the forty fatal cases, or 15 per cent.

Case I.—A child, æt. 4½, sixteen hours after the operation had hæmorrhage, followed by death upon the fourth day.

Case II.—A man, æt. 20, died upon the twenty-sixth day after repeated bleeding.

Case III.—A man, æt. 38, after the removal of a large stone, sank upon the third day.

Case IV.—A man, æt. 49, having had continual oozing of blood for two hours after the operation, gradually sank upon the fourth day.

Case V.—A man, æt. 52, six days after the operation had secondary hæmorrhage, this continued at intervals till the twelfth, and upon the seventeenth he sank exhausted.

Case VI.—A man, æt. 56, on the fifth day had bleeding, and sank upon the eighth.

In three of the above cases chloroform was administered, and in three not. In four other fatal cases hæmorrhage followed the operation; two dying from urinary infiltration, one from pyæmia, and one from acute suppurative inflammation of the kidney. In the two former chloroform was not employed, in the two latter it was.

II. *Cases in which the patient never rallied after operation.*

Under this head are five cases, or 12·5 per cent.

Case vii.—One, a man, æt. 70, who had had symptoms of stone for nearly three years, his bladder was very irritable, and would not contain more than a few ounces of water. Two calculi were removed by lithotomy under the influence of chloroform; the wound sloughed after the operation, and the patient never rallied, dying upon the fifth day.

On examination after death, the lungs were found œdematous, and heart having undergone the senile fibrous change of structure. The kidneys were pale and soft, and, microscopically, the tubules were found filled with granules and fatty matter; their pelves were healthy, as also were the ureters. The bladder was small, its muscular coat was somewhat hypertrophied and sacculated, the mucous membrane was entire and comparatively healthy. The prostate was slightly enlarged. The perineal wound was sloughing. The peritoneum and other viscera were healthy.

Case viii.—A man, æt. 48, after experiencing symptoms for eighteen years, was lithotomized at his own urgent request. He was an extremely unfavorable subject for operation. His urine was offensive and purulent, and for some time previously charged with solid phosphates. After the operation, he appeared for several days to be doing well, being much relieved from his severe pain; and although no marked symptoms appeared, he sank upon the fourth day. The necropsy revealed a healthy peritoneum; pale and mottled liver; kidneys large but healthy; ureters normal, and bladder but little hypertrophied, its mucous membrane was of a dark olive colour, and was thickened and abraded upon the summits of all the rugæ. There were two or three small sacculi present, and the bladder contained some dark mucus. The prostate was healthy and cleanly cut. Chest and other viscera were quite healthy.

Case ix.—The third case was in a man, æt. 44, from whom a stone was removed which had formed round a portion of

broken bougie left in the bladder. He sank rapidly after its removal. After death the kidneys were found mottled and large. Bladder of moderate size, with some old spots of ulceration upon its mucous walls nearly cicatrized. Prostate was large and cleanly cut, there was no sign of reparation in the wound; the abdominal and thoracic viscera were quite healthy, and no other signs of disease visible.

Case x was in an old man, æt. 72, from whom a large stone was removed through a deep perinæum; after forty-eight hours he died exhausted. The post-mortem examination revealed flabby and coarse kidneys, ureters dilated to about twice their natural size. Bladder dilated, and its mucous membrane reddened in patches from recent inflammation, and in points ulcerated, evidently of old standing, from the thickened edges. Between the openings of the ureters into the bladder a pouch existed behind the prostate, capable of holding a large chestnut. The third lobe of the prostate was somewhat enlarged, and two sections of the gland had been made in the operation. No infiltration of urine was present.

Case xi was in a man, æt. 42, who sank twenty-four hours after the operation; there was no hæmorrhage or visible cause of death, and no post-mortem to enable us to discover one.

In the first case only was chloroform administered.

III. *Pyelitis, Inflammation of the Kidneys, as causes of death.*

Under this head are included six cases, or 15 per cent.

Case xii.—A man, æt. 65, after the operation of lithotomy, gradually sank, and died upon the eleventh day. The chest and peritoneum were found healthy. Kidneys contracted from old disease, speckled, white, granular, and firm, and their structure sprinkled with purulent deposit. The ureters were large, and bladder thickened; its muscular coat was hypertrophied, and mucous lining coarse, and in parts abraded and sloughing. External to the muscular coat, and beneath the peritoneum, was an abscess the size of a chestnut, which

contained pus and a slough. Incision was limited, and its surface covered with dirty fibrin. The liver was coarse, and its tunic thickened. The spleen was soft, small, and pale.

Case xiii.—A man, æt. 58, died upon the sixth day after lithotomy. Both kidneys were found inflamed, the left the most so, and in one patch almost gangrenous. Bladder thickened, and its mucous membrane covered with adherent lymph, in the lines of the rugæ particularly, and about some small pouches near the prostate. The thoracic and abdominal viscera were healthy.

Case xiv.—An adult, after lithotomy, dying, his kidneys were found to contain many cysts, and their cortical structure granular and contracted; their pelves were ecchymosed, dilated, and contained purulent mucus. The ureters also were dilated and diseased. The bladder was thickened and contracted, its mucous membrane sacculated, and in one a calculus had been imbedded. The stone, however, at the time of the examination was found in the cavity of the bladder. The mucous membrane was granular and disorganized. Prostate gland enlarged, and the line of incision through it was very free. The external wound was in a sloughing state. Peritoneum contained some serum, and was intensely injected. Thoracic and abdominal viscera were healthy.

Case xv.—A boy, æt. 14, after lithotomy, died about the fourteenth day. The right kidney was found to contain large cysts in its cortical structure and pelvis, all communicating to form one large cyst, surrounded externally by a thin layer of cortical structure. The tunic separated with difficulty. The ureter was three times its natural size, adherent to the surrounding cellular tissue, and irregularly twisted in consequence of external adhesions. The left kidney was also dilated, with its pelvis and ureter; the sac contained purulent serum, and on its inner surface were points of injection with lymph. The bladder was contracted and thickened, its mucous membrane irregular and sacculated; it contained puriform mucus, highly ammoniacal. The incision into the bladder had apparently closed, but externally the wound was granulating and would soon have healed. The peritoneum was slightly injected,

and some slight effusion of lymph existed. The other viscera were healthy.

Case xvi.—A man, æt. 56, having been cut, the operation being followed by free hæmorrhage, died upon the following day. After death, acute suppurative inflammation of the kidneys to a most extensive degree was found to have existed; the organs were large and swollen, and infiltrated with purulent deposits throughout their cortex; their pelves and ureters were dilated, and mucous membrane inflamed. The bladder was comparatively healthy, two small ulcers existing at the neck. The viscera generally were fatty.

Case xvii.—A man, æt. 43, having convalesced after the removal of a calculus from the prostatic portion of the urethra, upon the thirty-fifth day was seized with diarrhœa, his urine became purulent, and symptoms of irritative fever made their appearance; these symptoms continued, and upon the forty-sixth day he died. After death the kidneys were found pale, their pelves dilated, and in one the pelvis and calyces were almost sloughing. At the right side of the bladder there was a pouch, which contained a calculus the size of a pigeon's egg; the mucous membrane was gray, sloughing, and irregularly calcareous. The calculus was covered with layers of phosphates; the membranous portion of the urethra was opaque, the mucous membrane thickened, and immediately behind it was the line of incision, smooth, and firmly united, except anteriorly, where it presented an opening which admitted a probe, and communicated with a sinus which passed to the perinæum.

IV. *Pelvic Cellulitis as a cause of death.*

Of all the dangers which follow the operation of lithotomy, pelvic cellulitis may be mentioned as the one which, by itself and in combination with other morbid complications, generally proves the most fatal. In its advance it is somewhat insidious, and often is only positively made known when some peritoneal complications make their appearance. Its cause has generally been assigned to a too extensive incision of the neck of the bladder; but the careful consideration of the cases

which I have now collected would not appear to confirm this general opinion, but to suggest that pelvic cellulitis, although a fatal complication, is one that for the most part arises without urinary infiltration, as a result of continuity of a structure which has become inflamed from the necessary injury inflicted upon it by the operation, or by the presence of a calculus.

In the following cases such an opinion seems to be supported, as also in others associated with other complications.

Under this head of pelvic cellulitis as a cause of death are numbered six cases, or 15 per cent.

Case xviii.—A healthy child, æt. 6, having had an oxalate of lime calculus removed by lithotomy, without the slightest difficulty, appeared to progress favorably till the noon of the following day, when pain and tenderness of the hypogastric region made their appearance. On the second day symptoms of severe prostration came on, which proved fatal at night, or forty-eight hours after the operation.

Post-mortem.—In the pelvis the peritoneum was somewhat injected, and in parts glued feebly together, more especially at its sides. The cellular tissue subjacent to the peritoneum in the anterior part of the pubic region was infiltrated with sanguinolent, but not puriform fluid; and posteriorly, inferiorly, and laterally was softened and easily broke down, and was in parts infiltrated with sanious, sero-purulent fluid; this infiltration of cellular tissue extended upwards towards the kidneys. Mucous membrane of bladder slightly red, but appeared otherwise healthy. Kidneys and other viscera were healthy. The incision through the prostate was limited.

Case xix.—A boy, æt. 15, gradually sank after lithotomy.

The bladder appeared bruised on its inner surface, and its coats thickened. The pelvis contained much pus, which had passed through an opening in the peritoneum which communicated with an abscess between the fundus of the bladder and the peritoneum. The intestines at this part were adherent to each other. Viscera and other parts were healthy.

Case xx.—A boy, æt. 14, having had symptoms of stone

for ten years, was cut, when on the fifth day symptoms of peritonitis appeared, which proved fatal in twenty-four hours. No post-mortem examination was made.

Case xxi.—A fat man, æt. 50, was lithotomized, and the stone removed with some difficulty, as it continued to elude the forceps. The patient never rallied, and died thirty-two hours after the operation.

The pelvic peritoneum was found after death to be minutely injected, and in the pelvis was some slightly puriform effusion. The cellular tissue beneath and round the bladder was extremely lacerable. The prostate was cleanly cut. The mucous membrane of bladder was ecchymosed, but otherwise healthy. Kidneys slightly mottled; other viscera healthy.

Case xxii.—A man, æt. 51, after lithotomy, had some oozing of blood; did well till the fifth day, when marked symptoms of pelvic cellulitis appeared, and he died upon the sixth. No post-mortem examination was made.

Case xxiii.—A man, æt. 54, after being cut, had slight hæmorrhage. Upon the second day erysipelas of parts appeared, upon the sixth rigors, followed by death upon the eighth, with symptoms of pelvic cellulitis. No post-mortem permitted.

V. *Pyelitis and Pelvic Cellulitis as a cause of death.*

The combination of pyelitis and pelvic cellulitis is not an uncommon one, as out of the forty fatal cases there are six instances, or 15 per cent.

Case xxiv.—A boy, æt. 14, having had symptoms of calculus from infancy, was lithotomized, although his urine was purulent; some blood was lost at the operation, and on the second day some pain and tenderness of the abdomen, with general symptoms of peritonitis, made their appearance. He improved by treatment for a few days, but his powers began to fail, and upon the tenth day he died.

After death, the peritoneum was found granular and greasy,

from recent inflammation, particularly its pelvic portion. Kidneys were reduced to a mere shell, the cavity being filled with purulent fluid; in the little cortical structure that remained recent pus was visible. Ureters as large as small intestines, thickened and inflamed. Bladder contracted, walls hypertrophied, and its mucous membrane uneven and rugose. The tissue round the bladder was in a state of suppuration, behind and between the bladder and the rectum, passing upwards into the sheath of the rectus abdominis muscle. The wound at the neck of bladder was at its usual place, and not too extensive. The other viscera were healthy.

Case xxv.—A man, æt. 34, having had symptoms for years, was cut, and a large oxalate of lime calculus, covered with phosphate, removed; great depression followed the operation, and on the following day acute pain in the hypogastric region made its appearance; this rapidly spread, and on the second day he died. The right kidney presented a mere capsule containing pus; the left enlarged, but healthy. The ureters were normal. Bladder thickened, and its mucous membrane at the neck ecchymosed. The cellular tissue round the bladder was filled with pus. Other viscera were healthy.

Case xxvi.—A man, æt. 25, having experienced most severe symptoms for eighteen years, and obstinately refused to submit to an operation, at last, from the intensity of his suffering, sought it in despair. The operation was attended with much difficulty, one of the calculi having been nearly the size of a small egg, but being lamellar it broke into several portions. The second stone was a smaller one, the sides of which had little or no appearance of having been worn.

The patient survived only three days, having gradually sunk.

The abdomen only was examined after death. There was considerable peritoneal inflammation, particularly at the lower part of the abdomen, which was bathed with a brownish puriform fluid. The kidneys were nearly all absorbed; they contained large cysts filled with sero-purulent fluid; the ureters were as large as one's fingers, and very tortuous. The bladder was nearly half an inch in thickness, its mucous membrane

thickened and granular, of a livid and dusky-red colour, with a considerable quantity of adherent coagulable lymph. About the middle of the bladder, and at its side, was a small opening through the muscular coat, which nearly led to the cellular tissue around; it was irregular, with a purulent surface. It had no appearance of having been incised, but it is not improbable that a small pouch had existed, and that the irritation inseparable from the repeated introduction of the instrument had contributed to effect the opening. The cellular tissue in the pelvis was soft and lacerable, and sprinkled with numerous points in which suppuration was commencing. The other viscera were healthy.

Case xxvii.—A man, æt. 68, who had been the subject of stricture for twenty years, and for the last five months had suffered much from severe bladder-symptoms, after dilatation of the stricture, was lithotomized, and an oxalate of lime calculus coated with phosphates removed. Some slight oozing of blood followed the operation; but the man never rallied, and sank upon the third day.

On necroscopic examination, the kidneys were found to be degenerated, and the pelvis of the left inflamed. Bladder was thicker than natural; its mucous membrane was of a dark colour and in places sloughing, and adherent to it were patches of phosphates. The cellular tissue round the bladder and rectum and sides of pelvis, nearly as high as the psoas muscle, was inflamed and suppurating in small points of pus. Wound at neck of bladder was almost sloughing. The urethra showed the appearance of a cured stricture in its spongy portion. The mucous membrane was rough and inelastic at the spot, and covered with old adventitious deposit. The other viscera were healthy, except some senile changes.

Case xxviii.—A man, æt. 59, after symptoms for six years, was operated upon with difficulty as the stone was impacted; much blood was lost at the time; and, fifteen hours after, he died rather unexpectedly. After death the heart was found enlarged, and its muscular tissue encroached upon externally by fat; the coronary arteries were much diseased, and atheroma upon the valves. The kidneys were much diseased, from

chronic inflammation; the cortex was soft, red, and contracted, and full of purulent deposits. The pelves contained pus, which distended them. Ureters were dilated, and mucous membrane inflamed. Bladder was contracted, and externally looked healthy; its interior presented two portions, having very different aspects; close to the neck was a pouch where the calculus had been impacted, and above this the more healthy-looking bladder which had held the urine. This was somewhat thickened, and its mucous membrane inflamed. The lower portion which surrounded the sac was raised, soft, and vascular when in contact with the stone, and the coats beneath were soft. Round the bladder, in the cellular tissue, was some brown, watery, purulent fluid, the result of inflammation. The prostate was somewhat enlarged and freely divided.

In the above case it is clear that as the patient had only survived the operation fifteen hours, the pelvic cellulitis must have been the result of the presence of the stone, and not the consequence of any operative interference—well bearing out the opinion expressed in a former page.

Case xxix.—A man, æt. 22, after lithotomy, died; although the period and symptoms are not mentioned.

The peritoneum was found acutely inflamed. The left kidney was small, and its glandular substance was nearly absorbed; its pelvis was enlarged, and contained a calculus the size of a swan-shot. The right was larger than natural, soft, pale, and flabby; but contained no trace of distension or obstruction. Left ureter large and thin; but nowhere evincing any recent obstruction. Bladder but little thickened, mucous membrane but little altered. Prostate cleanly cut, and but very moderately. The cellular tissue at base of bladder infiltrated with pus. Wound sloughing. Other viscera healthy.

VI. *Pelvic Cellulitis associated with accidental causes.*

The three following cases afford good instances of the accidents with which the operation of lithotomy may be attended. The first is a case where the rectum was punctured;

the second of perforation of the posterior wall of the bladder; and the third of sloughing of the rectum, &c., after the removal of a large calculus.

Case xxx.—A boy, æt. 9, was operated upon, the double-cutting edged gorget being used. Some difficulty was experienced in extracting the stone, on account of its large size. On the following day he complained of great pain in the lower part of the abdomen and in the wound, fæces passing by the latter. On the second his excitement became worse, attended with delirium, and towards evening he died.

After death acute suppurative inflammation in the cellular tissue surrounding the bladder was detected, extending for a considerable way between the body of the bladder and the peritoneal covering. The rectum was perforated just above the sphincter for about an inch. The prostate gland was not entirely divided, a small portion remaining whole on each side of the urethra. The bladder was much thickened; but its mucous lining appeared healthy. The peritoneum and other viscera were healthy.

Case xxxi.—A boy, æt. 5, after lithotomy, attended with hæmorrhage, died, twenty hours after the operation.

Miliary tubercles were found in liver and bowels. The bladder was surrounded with red serum, its posterior wall was deeply injected, and covered with a film of lymph. Upon opening the bladder, the incision through the prostate was found to be very limited; but near the trigone a puncture was seen half an inch in its posterior wall, full of dissolving blood. The kidneys and other viscera were healthy.

Case xxxii.—A man, æt. 65, having had symptoms of stone for six years, was operated upon and a large calculus removed. Upon the fifth day he died.

The thoracic viscera were healthy. The peritoneum was covered in patches with flakes of lymph. The liver was mottled and congested. Spleen natural. Kidneys large and flabby, with cysts. The external wound was sloughing, and the finger could be passed from the rectum into the opening made for the extraction of the stone. The incision through

the prostate was free, and extended to the neck of the bladder. The mucous membrane of the bladder was ecchymosed in a few spots. In the anterior wall of the rectum an elliptical opening existed, one inch and a half long. Diffuse suppurative inflammation extended in the cellular tissue between bladder and rectum, and in the recto-vesical pouch; at one point the peritoneum was in a sloughing condition, but no perforation had taken place. Suppuration had also extended behind the peritoneum, as high as the kidneys on the left side and to the crest of the ileum upon the right.

VII. *Pyæmia as a cause of death.*

Five cases of the forty died with symptoms of pyæmia, or 12·5 per cent.

Case xxxiii.—A man, æt. 19, who had experienced symptoms of stone from infancy, was operated upon, and a small oxalate of lime calculus removed; the operation was followed by considerable hæmorrhage, arrested by the plug. On the fourth day it returned, and again upon the eighth day; upon the fifteenth rigors and symptoms of pyæmia made their appearance, followed by death upon the twenty-sixth day.

On examination after death, the lungs were found to contain lobules of consolidated tissue, and some pleurisy. Liver pale. Peritoneum and intestines healthy. Kidneys were large; pelves ecchymosed and dilated. Ureters also were dilated. Bladder thick; mucous membrane natural, and slightly ecchymosed near neck and orifice. Upon the left side of the bladder, in the cellular tissue, a small deposit of healthy pus was found; a second existed under the subpubic ligament. Between the glutei muscles a large abscess existed; but not communicating with the pelvis. Pus existed in the cells and veins of the corpora cavernosa. The left branch of the dorsal vein of the penis, in its passage to unite with the prostatic veins, had been obstructed and prevented the passage of the blood; one inch further another closure was discovered, and between those points the vein was full of a yellow thick fluid like pus.

The perineal wound had almost healed, admitting only a probe.

Case xxxiv.—A man, æt. 54, with an impaired constitution, and irritable bladder after lithotomy, died upon the fifth day, without any marked symptom.

The necroscopical examination revealed lungs filled with lobules of inflamed tissue, easily lacerable, and becoming purulent. The right kidney was large, and subject of acute suppurative inflammation, involving all its structures, and its pelvis acutely inflamed; the right ureter also was inflamed and dilated. The *left* kidney was quite healthy, except two small white specks upon its surface; as also was the left ureter. The bladder was firmly contracted; the mucous membrane covered with a small quantity of purulent mucus, but otherwise healthy. The whole extent of the wound was in a sloughing condition, and the cellular tissue round the bladder in a similar condition. No suppuration had occurred. The incision was limited, through a prostate somewhat enlarged and indurated. Peritoneum and other viscera were healthy.

Case xxxv.—A man, æt. 57, after lithotomy was convalescing, when he was seized with rigors and pyæmic symptoms upon the seventeenth day, and died upon the twentieth.

Case xxxvi.—A man, æt. 58, with severe symptoms, old bronchitis, and great constitutional depression, after eight years' suffering, was operated upon, and a large calculus, weighing two ounces, removed. He gradully sank upon the thirteenth day. After death, pleurisy and pyæmic lobular pneumonia were detected. Kidneys wasted and contracted, with much deposit of pus in their cortical structure. Pelves and ureters were also slightly inflamed. Bladder was thickened and contracted; its mucous membrane sloughing, and covered with phosphates; the cellular tissue round was infiltrated with pus. The wound was sloughing.

Case xxxvii.—A man, æt. 44, after lithotomy, by which an oxalate of lime calculus was removed, progressed favorably till the twelfth day, when diarrhœa and symptoms of pyæmia

appeared, from which he rapidly sank. No post-mortem was made.

VIII. *Acute Cystitis as a cause of death.*

This was illustrated in the case (No. XXXVIII) of a man, æt. 57, who for twelve years had been suffering from symptoms of calculus in his bladder. He was operated upon, and a large stone, composed of the oxalate of lime, covered with phosphatic deposit, removed. In forty-eight hours he died, with symptoms of acute cystitis.

Two cases remain to be related—one of the child which died with acute inflammation of the air-passages after the administration of chloroform, and the second where peritonitis seemed to be the cause of death.

Case XXXIX.—A healthy child, æt. 2, was seized two hours after the operation of lithotomy, performed under the influence of chloroform, upon a cold February day, in a cold operating theatre, with quickness of respiration, attended with some difficulty. These symptoms rapidly became worse, and, six hours afterwards, it was evident that acute bronchitis was present. The disease progressed rapidly, and proved fatal forty-eight hours after the operation. After death, the larynx, trachea, and bronchi were found to have been acutely inflamed; their mucous membrane was of a bright red colour, soft, swollen, and slightly granular upon its surface. The whole of the glottis and under surface of the epiglottis participating in the inflammation. The tubes were filled with greenish, tenacious mucus, through both lungs. The lungs, heart, and abdominal viscera were healthy. In the pelvis some slight subperitoneal ecchymosis was visible. The kidneys and bladder were healthy, and the incision into latter limited.

Case XL.—A child, æt. $2\frac{1}{2}$, although fat, had several indications of ill health; his stools were unnatural—sometimes green, and sometimes clay-coloured. Tongue furred, and he was fretful, and appeared to be suffering from abdominal pain. As these symptoms were thought to have been kept up by the

presence of a calculus, he was operated upon. The child appeared to be doing well for twenty-four hours, when he suddenly became ill, and died upon the third day.

After death, the peritoneum, especially at the lower part of the abdomen, was minutely injected, some lymph glueing the lower convolutions together. The mesenteric glands were enlarged, and the Peyer's patches in the intestines. The kidneys were mottled, and of a pale colour; the right ureter was dilated. Bladder was healthy. The incision through prostate was regular and somewhat free, apparently incising the neck of the bladder. There was a good deal of coagulated blood behind the peritoneum, in pelvis, at the left of the bladder, and on the iliac fossa.

TABLE III.

Influence of Chloroform upon the fatality of Lithotomy.

	Cases in which Chloroform was given.					Cases in which it was *not* given.			
Periods.	Ages.	Number.	Cured.	Fatal.	Per centage.	Number.	Cured.	Fatal.	Per centage.
1.	5 years of age and under	24	22	2 or	8·33	31	30	1 or	3·33
2.	6 years and 10 inclusive	17	17	– „	—	21	21	– „	—
3.	11 „ 15 „	13	12	1 „	7·69	11	10	1 „	9·09
4.	16 „ 20 „	4	2	2 „	50·	8	8	– „	—
5.	21 „ 30 „	2	2	– „	—	8	8	– „	—
6.	31 „ 40 „	1	1	– „	—	5	5	– „	—
7.	41 „ 50 „	4	2	2 „	50·	3	1	2 „	66·66
8.	51 „ 60 „	8	3	5 „	62·5	10	5	5 „	50·
9.	61 „ 70 „	3	1	2 „	66·66	2	1	1 „	50·
10.	71 „ 80 „	–	–	– „	—	1	–	1 „	100·
		76	62	14	18·42	100	89	11	11·

Of the two fatal cases which occurred during the first five years of life, in which chloroform was given, one died from hæmorrhage, which came on sixteen hours after the operation, and proved fatal upon the fourth day. The second was a boy, æt. 2, who was seized, two hours after the operation, with acute inflammation of the air-passages, which destroyed him upon the second day. The operation was performed in a cold theatre, upon a February winter's day. The case in which chloroform was *not* given died from urinary infiltration and peritonitis, the result of perforation of the posterior wall of the bladder, in twenty hours; the operation, however, having been followed by free hæmorrhage.

The fatal case which took place between the ages of 11 and 15, in which chloroform was used, was caused by chronic pyelitis and absorption of the kidney, with pelvic cellulitis. The case which occurred at the same period in which chloroform was *not* employed, proved fatal upon the sixth day, with symptoms of peritonitis.

The period in which the fatality was comparatively the greatest, the comparison turning against the administration of chloroform, is the fourth; when it will be seen that 2 cases out of 4 proved fatal when the anæsthetic was administered, and not one of 8 in which it was not given. The cause of death in one case was pelvic cellulitis; in the second pyæmia; the operation in both instances having been followed by free hæmorrhage. In the periods which follow the advantage which one table gives over the other is of no marked character, the increase of one period in one table being counterbalanced by a corresponding increase in the other in the succeeding period. And taken as a whole, the balance is about equal.

Of the 9 fatal cases which are numbered in which chloroform was employed, one man, æt. 49, sank upon the fourth day from loss of blood; and of the remaining 8, in all the kidneys were found much diseased, either with acute suppurative inflammation of their structure, or some chronic change.

Of the 8 cases where *no* anæsthetic was administered, one man, æt. 42, sank in twenty-four hours after the operation, the existence of hæmorrhage not being mentioned; one, æt. 72, died forty hours after the operation, in which a very large stone was removed; one man, æt. 52, died upon the eighteenth day, secondary hæmorrhage having taken place upon the sixth day; one man, æt. 44, died from diarrhœa and phlebitis, the day not being mentioned; two, æt. 54 and 65 respectively, upon the eighth and fifth days, with pelvic cellulitis; one, æt. 51, with pelvic cellulitis, which took place upon the fifth and proved fatal upon the sixth day, considerable oozing of blood having followed the operation; and one, æt. 57, who upon the sixteenth day had nearly convalesced, when rigors and symptoms of phlebitis set in, proving fatal upon the eighteenth.

Taken as a whole, of the 14 fatal cases where an anæsthetic was administered, 2 died from hæmorrhage, or 14·27 per cent.;

1 from inflammation of the air-passages; 1 from pyæmia after hæmorrhage; 1 from pelvic cellulitis after hæmorrhage; and 9 from acute or chronic disease of the kidneys, with pelvic cellulitis.

Of the 10 cases where *no* anæsthetic was employed, 1 died from hæmorrhage, or 10 per cent.; 1 sank twenty-four hours after the operation, probably from hæmorrhage, although the fact was not stated. One old man sank. Three died from pelvic cellulitis, in 1 of which much blood followed the operation; 1 with symptoms of peritonitis, probably associated with pelvic cellulitis; and 2 from pyæmia.

The conclusions which may be drawn from the above are somewhat negative. Taking the deaths from hæmorrhage only, the difference is against the administration of chloroform 4·27 per cent. But taking hæmorrhage as a symptom, and either producing death or occurring so copiously as to reduce the patient, and thus allow secondary causes to act more prejudicially upon him, the balance in favour of the administration of chloroform is 1·43 per cent.

The only case (No. XXIX) which, perhaps, tells decidedly against its use is the child, æt. 2, who died upon the second day after its administration. But here the fact of the operation having been performed upon a cold winter's day, in a cold theatre, must be taken into account, and perhaps taken alone we should not be justified in deciding that chloroform was the only cause.

TABLE IV.

Analysis of the 40 *fatal cases as regards the cause of death and influence of Chloroform.*

6	cases	died from hæmorrhage . .	in 3	chloroform was given,	in 3 not.
5	„	sank after the operation . .	in 1	„	in 4 „
6	„	died with pyelitis, &c. . .	in 5	„	in 1 „
6	„	„ pelvic cellulitis . .	in 0	„	in 6 „
6	„	„ the two former complications . .	in 3	„	in 3 „
3	„	„ pelvic cellulitis, from accidental causes .	in 0	„	in 3 „
5	„	died from pyæmia . . .	in 1	„	in 4 „
1	„	„ cystitis . . .	in 1	„	in 0 „
1	„	„ bronchitis . . .	in 1	„	in 0 „
1	„	„ peritonitis . . .	in 0	„	in 1 „

The above analysis yields a somewhat similar conclusion as regards the influence of chloroform upon the fatality of lithotomy, as the previous table; as regards hæmorrhage as a cause it is equal in both; and in cases where sinking after the operation was the cause of death, the table shows in favour of the administration of chloroform.

In the next line there is an argument against its use, as the cases of pyelitis are much more numerous when it was employed; but with respect to pyæmia its administration is again supported.

The fatal bronchitic attack might be cited as a marked instance against it, but upon the whole the argument against is very weak.

Conclusions.

1. That lithotomy is at least twice as fatal during the first five years of life as it is during the second.

2. That during puberty, or between 11 and 20 years of age (the third period), it is more fatal than during any earlier period.

3. That after 20 and up to 40 years of age, it is comparatively of small fatality.

4. That 30 per cent. of the fatal cases are during the first 20 years of life.

5. That 10 per cent. are during the second 20 years of life.

6. That 60 per cent. are above 40 years of age.

7. That 14·20 per cent. of the cases operated upon prove fatal.

8. That hæmorrhage is the cause of death in the proportion of 15 per cent.

9. That 12·5 per cent. of the fatal cases die from exhaustion, or simple sinking; and that these are generally above the middle period of life.

10. That pyelitis or inflammation of the kidney is the cause of death in 15 per cent.

11. That pelvic cellulitis is the cause of death in 15 per cent.

12. That this pelvic cellulitis is not generally the result of a too extensive incision through the prostate, but is the result of

continuity of a structure which has become inflamed from the necessary injury inflicted upon it by the operation, or by the presence of a calculus.

13. That the combined influence of pyelitis and pelvic cellulitis prove fatal in 15 per cent.

14. That 12·5 per cent. die from pyæmia.

15. That pelvic cellulitis, the result of accidental causes during the operation, may prove fatal in 7·5 per cent.

16. That disease of the kidney is found in at least 30 per cent. of the fatal cases.

17. That pelvic cellulitis is found in at least 37 per cent. of the fatal cases, either alone or associated with other disease.

18. That peritonitis, as the result of lithotomy and cause of death, is never found unassociated with other complications, such as pelvic cellulitis or perforation of the bladder.

19. That acute cystitis may alone prove the cause of death.

20. That chloroform, independent of its own special risks, does not seem to have any influence upon the fatality of lithotomy.

CASES

OF

RETENTION OF THE MENSES

RELIEVED BY

PUNCTURE THROUGH THE RECTUM.

By HENRY OLDHAM, M.D.

The two following cases are instances of retention of the menses within the cavity of the uterus, which were relieved by puncture through the rectum; the first case being the result of congenital absence of the vagina; the second, the closure of the vagina after labour, by adhesion of its walls, and cicatrization.

Case 1.—*Congenital absence of vagina; menses retained in the cavity of the uterus; relief by puncture through the rectum.*

Susan W., æt. 23, was admitted under my care at Guy's Hospital in March, 1850. She was a young person of slender form but womanly development, who had never menstruated. When she came into the hospital her health was feeble, which she ascribed to a severe illness which followed a surgical operation to open a passage to the uterus from the vulva, which had been unsuccessfully attempted, and from which she had not recovered.

She had lived at home in the Isle of Sheppey, and between 16 and 17 years of age the general marks of puberty were manifested, but the permanent absence of menstruation, and general delicacy of health had induced her to apply for medical

advice both at home and at the hospitals in London, and a malformation of the genital organs had been discovered.

When she was in bed, and the usual examination of the sexual organs was made with the index finger, it passed without difficulty into a passage, at the top of which was a globular, firm swelling, like a distended uterus, but neither cervix nor os uteri could be felt. This canal, however, which thus examined I had taken for the vagina, I subsequently discovered to be the urethra, the orifice of which was remarkably wide, and three quarters of an inch in length, and the canal itself distensible without effort and without pain, and yet it retained such perfect tonicity that she had always been able to hold her water the usual time. My suspicions were first excited by noticing a discharge of fluid follow the removal of the finger, which had a faint smell of urine, and on inspecting the organs I found that the site of the ostium vaginæ was occupied by this lengthened aperture of the urethra, and that between it and the fourchette there was scarcely any space, and not a trace of vaginal opening. The external organs were normal in their formation, but the most careful exploration of the intermediate space between the urethra and the rectum—(which could in this instance be made with a finger in each canal)—failed to detect any trace of a vagina, and there was no doubt in my mind of its congenital absence. Rising above the pubes, and occupying a central position, was a globular swelling about the size of a cocoa-nut, which in the course of several months that I observed it, was found to be more defined and hard at one time than another; but generally it was not painful when gathered in the hand, or when pressed with the fingers. This swelling was the uterus distended by menstrual fluid, and a finger in the rectum could detect a central indentation in a firm and rather large cervix, which marked the os uteri. By moving this tumour above, the part below moved correspondingly, and the result of several investigations was the conviction that the uterus distended with menstrual fluid lay in the same direction as the pregnant uterus between the fourth and fifth month, with the os and cervix directed towards the rectum and accessible from it; that the walls of the rectum and urethra were in close approximation, and that the absence of any portion of a

vaginal canal below the uterus had compelled the cavity of the body of the uterns to yield to the accumulating menstrual fluid and to enclose it.

The symptoms which had attended this accumulation were not marked by any great regularity of periodical menstrual suffering. The intervals of quiescence had been sometimes protracted to five months, and sometimes indications of menstrual action, such as lumbar, abdominal, and pelvic pain, abdominal fulness, with nausea, or even vomiting, lasting for two or three days, would appear at intervals of five, six, or eight weeks, but during the time she was in the hospital, and before it, regular monthly action was not clearly made out. Her general health had been indifferent, with a tendency to chlorosis, and no doubt the absence of menstrual effort really marked intervals of amenorrhœa. Occasionally, the local sufferings were very severe; distinct paroxysms of uterine pain, causing the greatest distress, and attended with constant vomiting, and lasting for three of four days, leaving her much exhausted. For the first three months after her admission into Guy's, the local pains had not been severe, but as her health improved, she had been seized with more marked paroxysms of uterine suffering, during which the uterus contracted rhythmically, and she really underwent all the sufferings of a resisted menstrual labour, for the subjugation of which she took morphia rather freely.

August 14th, 1850.—It was in an attack of this kind of unusual severity which had lasted four days, during which her sufferings were extreme, and that too, in spite of large and repeated doses of opium, that I resolved to penetrate the os uteri through the rectum, and so give exit to the menstrual discharge. For this purpose I introduced a curved trochar and canula with which surgeons puncture the male bladder, through the rectum to the os uteri, and a quantity of treacly-looking blood immediately followed. The operation was painless, but the instrument was not long enough for the purpose, and on withdrawing the trochar, the canula came out from the uterus. Still, the puncture which had been made allowed the menstrual fluid to escape slowly, and its evacuation was attended with great relief, and she passed a comfortable night. Early the following morning a quantity, estimated at ten ounces, of

the same fluid was discharged, with some fæces, and again the third day, after which it ceased. The uterine tumour was perceptibly diminished in size, but still to be felt above the pubes, though no longer painful. No bad symptoms followed the operation, and she went home in a week, with an injunction to return to the hospital on the recurrence of menstrual suffering.

On the 19th of September she was seized with the same severe pains, during which the uterus could be felt to contract in paroxysms, with incessant vomitings and great distress. The opening which had been made with the trochar had closed, but the os uteri felt more open, so that the finger, carrying the rectum before it, could be made to enter it, and during the severity of a pain, it was obviously stretched by the fluid being pressed into it. On this occasion I guarded the lower part of a sharp-pointed bistoury with lint wrapped round it, leaving about an inch from the point free, and flattening this against the forefinger of the left hand, I introduced it into the os uteri, cutting an aperture of about half an inch. A quantity of menstrual fluid was at once released, with immediate relief to her suffering; and altogether, on this and the following day, about a pint of the collected menses escaped, with a marked reduction in the size of the uterine tumour which still remained, however, above the pelvis. No pain or distress accompanied or followed this operation, and no attempt was made to keep the aperture open. Warm water enemata were alone employed.

On two other occasions I performed the same operation, making in all four, with the same ease, the same relief, and the same freedom from subsequent inflammation. Her general health improved speedily. After the fourth operation, the opening remained patent, although no means had been employed for the purpose, and for the future she menstruated through the rectum without pain or inconvenience, and with considerable regularity. She continued to reside at home for some time, and then went to America with her parents. She was cautioned by me never to marry.

A report from her in June, 1851, states:

"I am pleased to relate that, on the 8th of May, I was taken unwell, and have been so twice regular to the month. I

suffered but little pain. I should say, as near as I can judge, the first time there was a pint and a half passed, and the second time about half a pint. My general health seems very well."

I examined the abdomen in July, and found the uterine swelling much reduced. The opening through the rectum could be felt by the finger, but I abstained from probing it.

The last report I have received of this patient is from Cooperstown, January 13th, 1852, in which she says, writing to a relative:

"I am happy to tell you, in myself, that I have found no difficulty in wanting any relief. I still continue with the same relief."

Case II.—*Closure of the vagina by strong adhesion and cicatrization; menses retained in the cavity of the uterus; puncture per rectum.*

A married woman, æt. 36, was admitted under my care into Guy's, May 21st, 1851. She had had three children and several abortions. She had not menstruated for five months, and her medical man had discovered that the vagina was closed, and he requested me to admit her into the hospital. The account which she gave was, that her last child was born four years before, with instruments, and that she had menstruated regularly until January 5th, 1851, when it had ceased, and since then she had been subject about every month to aggravated pains in the loins and abdomen, and that sexual coitus could not be accomplished. No coherent or satisfactory history could be obtained.

I found, on examination, that the vaginal canal was obliterated from about three quarters of an inch of its orifice, by a firm union of its walls with a good deal of cicatrix tissue; and that this union was so consolidated, as to resist the firmest pressure of the finger, and no break or aperture could be discovered. By rectum the os uteri could be detected pointing backwards towards the bowel; it was closed, and there was no swelling below it. Above the brim of the pelvis the body of the uterus could be felt, clearly defined; which, on being pressed downwards, imparted a movement simultaneously to the os

as felt per rectum. The uterus reached six inches above the pubes, and was more vertically directed than in the gravid state, and the intestines were before it, so that abdominal palpation produced a tympanitic sound. The mammæ were shrunk. The diagnosis formed in this case was, that the uterus was distended with menstrual fluid, which could not escape on account of the closure by adhesion and cicatrization of the upper three fourths of the vagina.

At first, I hoped in this case to be able to find some small opening, which, on being enlarged, might restore a channel per vaginam for the exit of the menses; but, after repeated investigations, I found no trace of such an aperture; and the prospect of dividing the adherent walls with a knife, however carefully conducted, were too hazardous, from the danger to the contiguous viscera, to be encountered. Under these circumstances I resolved to puncture the uterus per rectum, and this was done with a sharp-pointed bistoury without difficulty. A quantity of the peculiar dark treacly kind of retained menses, at once escaped; and I passed the tip of my finger into the cut opening, and slightly tore it. On the following day she passed, as near as could be ascertained, a pint and a half of the same dark fluid, mixed with fæces, and the abdominal swelling was much reduced. There was some pain in the right iliac region on the third day, with tenderness on pressure, but it passed off under the influence of some Dover's powder, with fomentations and poultices. She remained in the hospital for a fortnight, and then went out, promising to attend as an out-patient, but she never made her appearance. When she left, the opening in the rectum had not closed.

Remarks.—The particular point in practice which these cases illustrate is, the ease, safety, and success with which the uterus, distended with menstrual fluid, may be relieved by puncture through the rectum, when the organic defect is a congenital absence of the vagina, or its occlusion by adhesion and cicatrization of its walls. Other operations designed to separate the interspace between the urethra and rectum, either by the knife or by traction, and so form a vagina in the connecting tissue, have been designed and practised by different surgeons, sometimes with success, at others with a fatal issue. These

operations, in the most skilful hands, are difficult to accomplish, and most hazardous to the patient,[1] and they have been deliberately rejected, in the judgment of competent men, as being too perilous to be justified. As a channel for the flow of the menses, there can be no compensating advantage in an artificial vagina over an opening through the rectum. It is true that, if the patient escape the dangers of having an opening made into the urethra, bladder, or rectum, and these organs are left with their functional power unimpaired, the channel thus formed might perhaps be kept open more readily than by the other method. But puncture per rectum is so slight and feasible an operation, that I have preferred to repeat it as the occasion may require, to exciting the irritation, and possibly the inflammation, which attempts to keep the opening patent would occasion, especially too when this may, as in Case 1, spontaneously occur. To attempt anything beyond making an efficient outlet for the menses, that is, to expect to form a vagina which shall admit of marriage and child-birth, is, in my opinion, to try for more than surgery can do. It appears to me to be impossible for a passage formed in the connecting tissue between two canals, to perform the entire functions of the vagina, and it is far better that marriage should be known to be a physical impossibility, than that its consummation should provoke disgust, disappointment, and estrangement.

The large size of the urethral canal in Case 1, which allowed the finger to pass into it without pain, and yet was unattended with incontinence of urine, is worthy of notice. A similar formation of the canal attended a case of imperforate vagina, which I published in 'Guy's Reports,' (Series II), vol. vi, p. 354. In both these instances the extreme width was congenital and part of the deformity, and not the result of artificial dilatation.

The collection of menstrual fluid within the cavity of the uterus was not so great in Case 1 as to represent the sum of a series of monthly fluxes from the date of its first commencement to the time of the operation. There were undoubtedly long intervals of amenorrhœa, and the feeble state of health which generally accompanies menstrual retention would favour

[1] Vide Amussat's case, 'Gaz. Med.,' Dec., 1835.

the suspension of the flow. On one occasion, when the patient had a slight attack of fever, I felt persuaded that the contents of the uterine tumour absolutely diminished. In the physical diagnosis of these cases of entire absence of the vagina, as contrasted with a partial development of the canal or a central closure of it, I lay great stress on being able to feel the os uteri through the rectum in a closed state. If there be a portion of the vaginal canal developed above, the menstrual fluid is safe to pass into it, and as it collects to bulge it out, and by degrees to stretch out the os uteri and cervix, and last of all the cavity of the body of the uterus. In a case which was published in an early number of the 'Guy's Reports,' with a drawing, this is admirably shown, and the preparation which it fell to my lot to be able to procure, is in the museum of the hospital.[1]

[1] Vol. ii (Series i), p. 244.

CASES

OF

DISEASE OF THE PULMONARY ARTERY

AND ITS VALVES.

By G. WHITLEY, M.D.

Morbid conditions of the pulmonary artery and its valves, though not unfrequently met with in *post-mortem* examinations, have very rarely been distinctly diagnosed during life. Of one form especially, regurgitation through the pulmonary sigmoids, Skoda, Wunderlich, and other good authorities state that it has never been recognised from auscultation. The three following cases of such affections, occurring in the course of a few months in the hospital, will, therefore, no doubt, be read with much interest.

Some analogous cases, met with on *post-mortem* examinations in the hospital several years ago, have also been appended.

Dilatation of pulmonary artery. (Plate VI.)

Case I.—Mary B—, æt. 44, admitted March 11th, 1857, under the care of Dr. Addison. Thirteen years ago she had an apoplectic seizure, and has never quite recovered the use of her left hand. Five months afterwards she had a bad miscarriage with profuse hæmorrhage. Ten months ago, being pregnant at the time, she fell backwards over a stool, and for a fortnight afterwards had hæmoptysis and hæmaturia. Her feet then began to swell, and the dropsy gradually extended

over her whole body. Six months ago she was prematurely confined, in the seventh month of pregnancy, and the dropsy soon appeared quite to have left her, but in the course of two months it returned, accompanied by severe cough and dyspnœa, with tenacious mucous expectoration. She has, of late, slept very badly, taken scarcely any food, and become much emaciated.

Present condition.—She is very anæmic, complains much of pain in the head, which is abnormally hot, and of frequently feeling very faint. The expression of her countenance is anxious and haggard in the extreme, her eyes are bright and the conjunctiva watery; her chest is well formed; there is extensive dulness on percussion on the right side, anteriorly, and at the left apex. Posteriorly, there is universal dulness on percussion on both sides of the chest. There is pain on pressure between the second and third costal cartilages on the left side. The veins in the neck are much congested. Pulse 84, small, and compressible. Abdomen much enlarged, with distinct fluctuation. Urine sp. gr., 1020, acid, albuminous.

Heart's impulse increased. Apex to be felt two inches below the left nipple, almost in the same vertical line. There is a well-marked *frémissement cataire* with each movement of the heart, perceptible over a space extending from one to three and a-half inches below the left clavicle, and three inches from the left border of the sternum. This is most strongly marked at a point three quarters of an inch to left of sternum, and one and a-half inch below the left clavicle. At the apex the normal sounds are heard. At the right border of the sternum, between the second and third cartilages, there is a loud rushing double sound, loudest with the systole, and the second sound of the heart is also heard normal. Both *bruits* are very rough in character, more audible towards the left, and loudest when the *frémissement cataire* is most strongly marked. Over the left clavicle and large veins of the neck a soft continuous murmur is audible, similar to the *bruit de diable.* The fact of the *bruits* being heard loudest towards the upper part of the left side of the chest, created considerable interest as to their exact locality, and my friend Dr. Hermann Weber, who saw the case, hazarded an opinion that they might have their origin in the pulmonary vessel.

March 13.—She is somewhat relieved by a blister to the chest, but is much troubled with hiccup, and takes very little food.

15.—Complains of severe pain in the head and great nausea, but does not vomit.

17.—Vomits constantly, and is unable to assume the recumbent posture from a sense of suffocation.

19.—Is much worse in all respects, the face and extremities are cold and livid, the pupils contracted, and sight dim. She cannot speak above a whisper, but appears to be in great pain.

20.—She died early this morning.

Post-mortem.—On opening the thorax the heart was seen to be very much enlarged, reaching quite to the walls of the chest on the right side. The pericardium contained but little fluid and showed no signs of inflammation. Only the right side of the heart was seen, hiding the small left ventricle by its immense size. The pulmonary artery passed upwards, of very large size, obscuring the aorta. Its two branches being also much dilated, concealed the bronchi and roots of the lungs. The right ventricle was more than twice the size of the left, which did not reach to the apex of the heart, and its walls were about three times the natural thickness. The carneæ columnæ were also immensely thick. The bicuspid was healthy, but some of its fibres were slightly thickened and had lost their transparency, as if from bygone inflammation. The pulmonary valves showed in a much more marked degree evidence of an old endocarditis, being much thicker than natural, and irregular in shape. At one spot there was much thickening and puckering, and between two of the valves a pouch had formed, constituting a fourth valve about a quarter of the natural size, the result probably of inflammatory adhesion of one of the valves to its sinus. All these changes were old. The pulmonary orifice no doubt admitted of regurgitation. It was of average size, four inches across when laid open, but immediately above, it dilated by an inch in circumference, and this larger calibre was continued into the right and left pulmonary arteries until they divided into their secondary branches. The right and left pulmonary artery, when distended, presented a very remarkable appearance from their great

size, being more than twice that of the aorta. Four fingers, side by side, could easily be passed into each vessel. The serous surface was covered with numerous patches of atheroma. The right ventricle and pulmonary arteries contained a semi-fluid, dark coagulum of blood. The lung-tissue was healthy, except that it contained some congested portions almost amounting to apoplexy. The right auricle was very much dilated, the superior cava and jugular very much distended with blood. The left ventricle was under the usual size, and its walls were thinner than natural. The anterior curtain of the mitral had very thick edges, indicating an old inflammatory change. Its orifice was rather small, but there was no evidence of regurgitation. The aortic valves were healthy, but the orifice as well as the whole aorta were exceedingly small. The coronary arteries were slightly atheromatous.

Case II.—Disease of pulmonary and aortic valves. (Pl. VII, Fig. 1.)

Elizabeth M—, æt. 36, admitted April 9th, 1857, under the care of Dr. Gull, to whom I am indebted for the particulars of the case during life. Has been ill nine weeks. With the exception of an attack of erysipelas thirteen years ago, has always enjoyed good health. No history of rheumatism. Two months ago had diarrhœa, lasting fourteen days. Had after this pains in the chest and cough, and began to lose flesh. Has never spit blood.

Present condition. — She is anæmic, sallow, and wasted. Between second and third cartilage on the left side there is a grating systolic murmur, remarkably loud, with *frémissement cataire*. There is slight dulness and prominence at this part. The murmur is audible to a considerable extent, but diminishes on every side of the spot indicated, the centre of which is the third cartilage and the second intercostal space. The normal sounds of heart are very distinct under the nipple. There is no murmur in the back; no dulness at the apices; bronchial râles throughout the chest. The line of intensity of the murmur corresponds to the axis of the right ventricle and pulmonary artery. Pulse 132, small, and sharp. No jugular pulsation. Respiration 32. Frequent cough, but no expectoration.

Tongue dry and rather brown. No anasarca of legs at any time. Urine scanty, dirty-brown from diffused urates, highly coagulable. The face is pale, and its expression anxious. The catamenia have ceased since her illness. The patient died ten days after admission.

Diagnosis.—Disease in pulmonary artery.

Post-mortem.—The heart was much enlarged in consequence of the increased size of its right side. The right ventricle and pulmonary artery were seen to project, as if they contained a firm clot, which was found to be the case on opening them. Large vegetations were attached to the pulmonary valves, and nearly the whole of the ventricle below was filled with *ante-mortem* clots and fibrinous coagula, undergoing integral changes. The small space that was left in the ventricle was filled with recent, soft coagulum, on removing which the greater part of the cavity was seen to be occupied by these *ante-mortem* coagula and vegetations. A large number were merely of the former kind, for they were found amongst the muscular *trabeculæ*, and rolled out when the heart was opened. They were of the shape of the spaces in which they had been formed; were smooth on the surface, quite white, and most of them firm throughout, though a few were softening in their interior. Below the valves and towards the septum, all such masses were closely adherent to the surface, although very many could be easily detached, leaving the serous surface shining, and healthy beneath.

To the whole of the convex surface of each valve was attached a large vegetation or growth, about the size of a marble. These were firmly attached, and must have almost closed the orifice when they met. The pulmonary artery itself was healthy. The right ventricle was somewhat enlarged, and its walls hypertrophied, as well as the various muscular columns. The left ventricle was of normal size. The convex surfaces of the valves were covered with vegetations in the same way as the pulmonary sigmoids, but much smaller, each mass being round and distinct, and attached merely to the central part. Below the middle valve, corresponding to the membranous partition in the septum ventriculorum, was a round opening which would admit of the passage of an ordinary-sized quill. This passed through into the right ventricle, not beneath the fixed curtain of the tricuspid valve, but above the attachment

of the anterior curtain. Immediately beneath the opening in the left ventricle was a transverse band, or ridge, and around it some hard vegetations, so that a kind of funnel-shaped passage was made, and if blood passed from one cavity to another, it must have been from left to right. The orifice in the right ventricular cavity was covered with vegetations, and emerged beneath a similar mass below the pulmonary valves. The tricuspid valve was covered with vegetations, both on its auricular and ventricular surfaces. On the former, as before said, they were found mixed with *ante-mortem* clots. On the auricular surface they were small, scattered along the free edge of the valve, and firmly attached.

Case iii.—Obliteration of pulmonary sigmoids.
(Plate VII, fig. 2.)

Martha G—, æt. 11, admitted October 22d, 1856, under the care of Dr. Rees. Her mother states that she had fits and paralysis of the lower extremities in infancy, and that she had diseased heart up to three years of age, that she then enjoyed good health until the Christmas previous to her admission, when she got wet and became jaundiced. She was sent into the hospital by her medical attendant as suffering from rheumatism and *morbus cordis.*

Present condition.—She is emaciated and sallow, and complains of pain all over her body, especially in her knees and head. There is slight paralysis of the lower extremities which improved soon after her admission. Cough troublesome at night, accompanied by pain in the chest. Urine always dark red and strong smelling.

November 27th.—Had hæmoptysis.

December 5th.—Spots of purpura appeared on various parts of the body.

8th.—Died suddenly.

A double *bruit* was always audible at the base of the heart.

Post-mortem.—Body moderately well developed. The heart is enlarged and its shape remarkable from the right side preponderating over the left, being nearly half as large again, and the right ventricle reaching far below the left, altogether forming the chief bulk of the organ. This, when the heart

was opened, was seen to be due to the disease of the pulmonary orifice. The right ventricle was found to be equal in size to that of a large adult heart, and the walls were slightly thickened and tough, as in hypertrophy. The right auricle was also very large, and filled with semi-fluid blood. The left auricle was of moderate size and filled with fluid blood. The pulmonary orifice, as well as the pulmonary artery and the parts around, were found in a most remarkable state of disease. The valves had entirely disappeared, but the serous surface at the part was excoriated, as well as the endocardium beneath, and a firm fibrinous clot was adherent to it. This was only seen by forcibly tearing off the coagulum, for the pulmonary artery and its branches were entirely filled by a firm, white, *ante-mortem* clot. On opening the ventricle, the recent soft clot was adherent to this firm mass projecting from the pulmonary artery, and upon separating this to expose the valves, they were found to be absent, as described, or only shreds of membrane took their places. It was difficult to say in some parts where the new material commenced, and the original structure ended; but it seems tolerably certain that only a small shred of one valve was left. Beneath the situation of the valves the endocardium was covered by vegetation or fibrine; and at one place the serous membrane was destroyed, and new fibrinous material was found beneath it and in the muscular structure, as if the latter had been involved in the inflammatory process. The surface of the artery was also roughened and the clot firmly adherent. This clot completely filled the vessel and also passed into the branches distributed to both lungs, as far as their second division, but not into the smaller vessels. The clot was of a pinkish hue, very firm, had a disposition to separate into layers, and was not at all softened in the centre.

The aortic valves were covered with vegetations on their ventricular sides. From their meeting surfaces there hung down large vegetations into the ventricles. These were firm and closely adherent. The structure of the valves themselves was healthy. The mitral and tricuspid valves and pericardium were healthy. There were some spots of red hepatization in the lungs, particularly at the left apex. The liver was congested (early nutmeg), and the kidneys presented patches of purpura.

Appendix.

We append also the histories of three other cases connected with preparations preserved in Guy's Museum. It will be seen that the third one to be related resembled Case I, and the other two, Cases II and III, already described.

Case IV.—Ellen C—, æt. 19, admitted November 19, 1841, under the care of Dr. Bright. Four months before admission she got wet, and soon afterwards had general dropsy with albuminous urine. The heart sounds said to be normal. She died a fortnight after admission, and on a *post-mortem* examination there were found only very slight traces of the pulmonary sigmoids, except the lines of their attachments, but enough remained to lead to the conclusion that recent rapid inflammation had destroyed them. The united attachment of two of them was a mass of fibrine as large as a French bean, a little bloody and granular. Above this, the artery was partially softened, eroded, and coated with fibrine. There was no dilatation of the right side of the heart, but the tricuspid was not healthy.

Case V.—A woman, æt. 38, came under the care of Dr. Lloyd, at the City Dispensary, in February, 1845. She was engaged in packing, and was constantly carrying heavy sacks up and down the stairs of a warehouse. About five weeks before, she quarrelled with her husband and received several blows on the chest. From this time she took to her bed and complained of pain in the side with difficulty of breathing. Dr. Lloyd, who saw her only a short time before her death, discovered a *bruit* with both sounds at the base of the heart. On *post-mortem* examination the pericardium was found healthy, as were also the aortic, mitral, and tricuspid valves, but the pulmonary artery was so obstructed that it would only admit a probe. On opening it, this narrowing was seen to be due to two large vegetations, each the size of a walnut, growing from two of the valves, the remaining valve being covered with smaller vegetations. The other organs were stated to be healthy.

Case vi.—A female, æt. 45, was admitted into the hospital, July 12, 1844, and died gasping, pallid, and unconscious about ten minutes after admission. She fell down suddenly in the street, near the hospital, and was supposed at first to have taken a drachm of powdered nux vomica.

Both the right cavities of the heart were much enlarged, the right auricle communicated with the left by a large opening; the walls of the right ventricle were much thicker than natural. The pulmonary artery was of extraordinary width, and its sigmoids were much thickened by vegetations on their free edges, but did not appear to admit of regurgitation. The right side of the heart was distended with dark, semi-fluid coagula. The aorta was very small, as was also the left ventricle in comparison to the right, and its walls were thickened. There had no doubt been long standing obstruction of the pulmonary circulation.

[This case is a counterpart of Case i.]

Plate VI and VII.

Illustrating Dr. Whitley's paper on Disease of the Pulmonary Artery.

Plate VI.

Refers to Case i, where the pulmonary artery and its branches were enormously dilated.

Plate VII.

Fig.

1. Refers to Case ii, where the pulmonary valves were covered with vegetations.
2. Refers to Case iii, where the pulmonary valves were quite destroyed.

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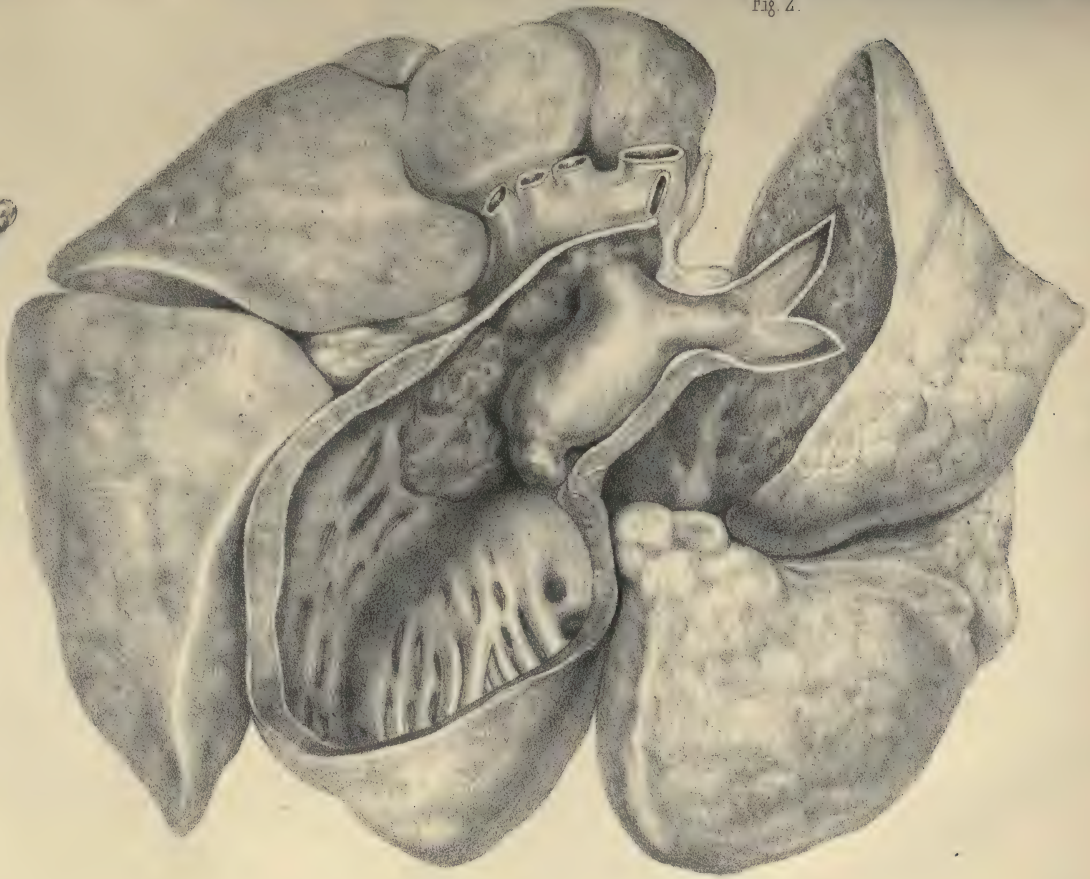
Plate VII

Fig 1.

Fig 2.



ON

ABSCESS OF THE BRAIN.

By WILLIAM GULL, M.D.

The brain exhibits in disease a tendency to suppuration which gives it a pathological rank with glandular organs. The bearing of this upon the therapeutics of cerebral affections in general, is both obvious and important, especially as to the use of mercury, since it is admitted that the diseases of tissues having this predisposition, do not bear the full action of that remedy.

A recent excellent writer[1] admits the occurrence of idiopathic cerebral abscess. I suppose he means no more than abscess whose origin is unaccounted for, since we have no evidence of any such intrinsic perversion of the nutrition of the brain as leads to suppuration. The nearest approach to such a result is in scrofulosis, but then only where the scrofulous deposit acts as an extraneous substance upon the tissue in the same manner as an hydatid cyst; in neither of which cases can the suppuration be considered idiopathic.[2] A perusal of the cases given by Abercrombie may have favored the opinion referred to, as he seems tacitly to assume an independent origin in many of them. But it is to be remembered, in contradiction to such an inference, that the cases he records are principally intended to establish the fact of suppuration, the different forms

[1] Lebert über Gehirnabscesse, Archiv für pathologische Anatomie, &c., Bd. x, 1856.

[2] The distinction here insisted upon is obviously more than a verbal refinement. Daily experience proves how much clinical investigation is prevented by the inappropriate use of the word idiopathic.]

of it and its general symptoms, and not avowedly to trace the causes. This of necessity is a later subject of inquiry.

It is in, what has been called, "metastatic abscess," that the causes are apt to be overlooked. The suppuration in the brain often appears as an isolated affection, and the local disease which gives rise to it is regarded as a mere coincidence. It is, indeed, only by multiplied examples that we can get to see the relation between the primary disease and the secondary effects. For instance, Abercrombie records the case of a gentleman who for years had been subject to cough and purulent expectoration, with cirrhosis of the lung, and who died of secondary abscesses in the brain. The connection between the disease in the chest and in the brain would, from this one case, appear only as a coincidence, but taken with Cases XII, XIII, XIV, given below, we should be prepared at the bed-side for a recurrence of the phenomena. These cases of secondary abscess are amongst the most obscure, whether we regard their insidious origin and latent course, or the primary diseases which give rise to them. The brain is especially liable thus to suffer, and in instances where the liver and lungs are unaffected. It was so in Case IX, where ileitis set up abscess of a mesenteric gland, which in its turn was the cause of many secondary abscesses in the brain, and in Case VIII chronic abscess of the abdominal wall was followed by several abscesses in the brain, though the other viscera escaped. Case IX is the more striking since according to our present theories of purulent infection, the capillaries of the liver ought to have suffered first. When the primary abscess is at a distance, the blood appears to be the only medium through which the morbid influence can be conveyed, but the steps of the process are not yet clear.

Although we have used the word "*metastatic*," we cannot admit the validity of the theory in the present subject. We have no evidence that a distant tissue begins to suppurate by some mysterious transference of force, like the sinking of one end of a balance when the weight is lessened at the other. Something of this kind may occur in the natural functions and growth of parts, but it is probably limited to the processes of nutrition under the regulation of the reflex working of the sympathetic system, and does not extend to such wide per-

versions as the formation of pus. The theory of the transmission of the morbid action through the cerebro-spinal nerves which some have endeavoured to establish by such instances, as the removal of a testis, followed by abscess in the opposite lobe of the cerebellum, is equally untenable, these cases being in all probability examples of secondary abscess through the blood, the seat of which is accidental.

With this tendency to secondary suppuration in the brain is also to be noted the fact of its latency. A person may perform all his duties and be in apparently good health, though for many months he may have a large abscess in the cerebrum. Case XIII is a remarkable illustration of this. The patient was even amused by the involuntary jerkings of the arm which ushered in the fatal inflammation around the cyst.

The latency of cerebral abscess seems explicable by the combination of several facts. It is generally seated in the substance of the hemispheres where it is known that extensive disorganization may go on without any indication, provided the corpora striata, thalami optici, and other central parts be not involved; the cerebrum and cerebellum appearing to have, like other organs, a surplusage not required on ordinary occasions.

Encysted abscess probably forms slowly, and does not so much destroy as compress parts, and when the compression is gradual and uniform there is a yielding which up to a certain point is compatible with function.

In many instances even at last it is not the abscess itself which occasions the symptoms, but the reactive inflammation around it.

The course of cerebral abscess is in our present experience always a fatal one. There are no known cases where the sac has contracted, and the pus dried up, as occasionally happens with chronic abscess in other parts. "At first sight," says Lebert "it may appear remarkable that with so frequent encysting of the abscess, and with a latent course often of many months, no instance of real cure should be known, whilst in softening and effusions of blood the formation of a cyst is the first step in the healing process. The cyst which surrounds the abscess is, however, altogether different from those mentioned. It is thicker, more vascular, and partakes of the quality which pyogenic membranes have of pouring out pus, so that instead

of being absorbed, the quantity is increased, the pressure on the brain heightened, and the way prepared for an unfavorable course as well as a fatal termination."

We can hardly admit that the structure of the cyst, is alone the cause of the unfavorable issue, since there is nothing in it different from that of chronic abscesses in general, which occasionally do contract and dry up. In Case XIV the pus was actually beginning to undergo the earthy infiltration indicative of such a process. It is probably rather to other circumstances than this that we must refer the fatal result. The pus of cerebral abscess is prone to undergo decomposition. All observers have noticed the occasional fetor of these collections, quite apart from any communication with bone or the external air. In this occurrence, and in the extreme alkalinity and mucoid character of the pus, which is so frequent in these cases, we cannot but recognise chemical peculiarities which oppose that quiescence of capillary action necessary to the process of cure. The surrounding tissue also after much stretching becomes inflamed, and so brings on a fatal termination.

The direction in which cerebral abscess extends is frequently in itself also a fatal one. Following the line of least resistance, it slowly approaches the cavity of the lateral ventricles into which there is at last rupture. This accident may give rise to the earliest acute symptoms indicative of important disease of the brain, and then the case may be singularly perplexing.

In contrast to the insidious course of the disease when the abscess is encysted, are some instances of acute suppuration, and often sloughing where the brain becomes involved by extension of disease from the ear, or when the inflammation is secondary to chronic disease of the nose as in Cases II and IV.

There is a form of the malady where in the early stage the symptoms are not altogether unlike those of continued fever. After the febrile state has lasted for some time there may be apparent convalescence in which either slowly or suddenly the final cerebral symptoms show themselves. These different phases of the case probably correspond to certain stages of the disease going on in the brain;—the onset of the inflammatory

action;—the gradual process of encysting;—and, lastly, the reactive inflammation from distension of the surrounding tissues. Case XI may be adduced as an illustration.

The details of the structure of the cyst are appended to Cases XII and XIV.

Lebert speaks of the granular character of the pus in cerebral abscess and of the small number of typical cells it contains. Similar observations were made in Case VIII. Such peculiarities are not noticed where the suppuration is recent, and are probably the result of secondary changes in the contents of the abscess. The same author in the article referred to also notices the fact that abscess generally forms in the white substance, rarely in the gray, though the latter is the more vascular. This is confirmed by all experience.

The time within which a cyst may form in the brain is shown in the following case, which lately occurred under the care of my colleague Mr. Birkett. A boy, æt. 14, whilst working in a factory received a backhanded blow from a hammer, causing compound fracture of the skull. He lay a day or two insensible, and then slowly recovered consciousness. On the sixth day from the accident, there was spasmodic twitching of the right side of the face, and loss of the use of the right arm. He was bled with relief, and two days after could grasp with the hand, but some degree of paralysis of the right side remained. At the end of three weeks the wound had progressed favorably and was nearly healed, but the boy was in a listless state. At the beginning of the fifth week he began to vomit his food, and complained of pain in the head. These symptoms were soon followed by drowsiness without any marked paralysis. He seldom spoke, but took food readily, seeming to live as a mere vegetable. He died eleven weeks from the accident. For the post-mortem details I am indebted to Dr. Wilks's report. Anterior to the point of injury, so that a trochar passed in would not have reached it, was an encysted abscess, containing about an ounce and half of pus of the usual character but not fetid. The cyst was an eighth of an inch thick, of a fibro-cellular structure, and so strong that by placing the finger in its cavity it was supported entire, whilst the brain-substance fell from it. The surrounding portions of the anterior and middle lobes were gray and

ochrey, and contained abundance of granule-cells. The cyst was surrounded on all sides to the thickness of an inch by the cerebral substance. Considering the youth and previous health of the patient, it is probable we have here a fair limit, at least in one direction, of the time necessary for the formation of such a cyst. The shortest period we can infer from it is seven weeks, it was probably nearer ten. The subject has a special value in etiology, since proof of the duration of an abscess may indirectly become proof of its cause, as may be shown in the following examples: In Case XII, a girl who had long been the subject of chronic suppuration in the chest, sickened with variola on the 27th January. On the 16th February she was convalescing favorably. On the 17th, she became delirious and comatose, and died on the 22d, with several encysted abscesses in the brain; the walls of the cysts being strong and vascular. It was a question whether these abscesses were the result of pyæmia, set up during the maturation of the variolous pustules, or secondary to the chest affection. The organization of the cysts negatived the former assumption, since it was not probable such structures could develope within fourteen days. Case IV is a converse instance. The patient had a severe fall from a carriage a year and a half before his death; he had also had polypus nasi for some time, and was exposed to severe cold just previous to the onset of the cerebral symptoms. There was no trace of a cyst, but the brain-tissue which surrounded the pus was softened and vascular, as in acute inflammation. Opinions were divided as to the cause of the abscess, whether it was due to the fall or to the chronic disease of the nasal mucous membrane. The absence of any limiting wall to the abscess, and the condition of the brain-tissue around, entirely forbad the supposition that it had been so long latent as a year and a half. On the contrary, taken in connection with the recent exudation over the sella turcica, these conditions were decidedly indicative of its relation to the disease in the nose. The medico-legal bearings of the subject are obvious. Lebert gives the following details.[1] After stating that the duration of acute abscess is from three to twenty-four days, he says, "Lallemand asserts that in one instance he found a soft limiting membrane

[1] Op. citat., p. 100.

as early as the thirteenth day. In two cases it was from the twenty-second to the twenty-fourth day, so that we may place the beginning of the formation of a cyst about the third and fourth week. The greatest number are found between the thirtieth and sixtieth days, in the following proportion: In two-thirds of the collected cases which could be used in the calculation two had a duration of thirty-two days; one of thirty-five days; one of thirty-seven days; two of forty-two days; one of fifty days; one of fifty-three days; one of fifty-five days; and three of sixty days. Within this period firm, organized cysts were met with, and the later the period the more readily were they separated from the surrounding brain-substance. There were lastly two cases in the third month, one of seventy-five days' and one of ninety days' duration. And last of all a case which lasted 105 days." To this last may be added Case XIII, where eight months probably elapsed between the origin and final issue of the case. The conditions under which cerebral abscess occurs, would lead us to anticipate great variety in its symptoms. We have seen that the disease may be from the beginning acute and rapidly progressive. In such cases the symptoms have for the most part a corresponding intensity. The most striking examples arise, as before-mentioned, from chronic disease of the ear or of the nose, in otherwise healthy subjects. Headache often intolerably severe is the most prominent feature. "I never wished so much to be well as I now do," said a strong man in the agony of his sufferings in one of these cases (Case IV). The headache is generally frontal, frequently more severe over the brow on the side of the abscess, but in this there is no uniformity. It is remarkable that, though there may be acute abscess, and sloughing brain and dura mater over an extensively carious temporal bone, yet the patient may make no such complaint of local pain as to draw attention to the source of the disease. No doubt many cases from beginning to end are from this cause involved in obscurity. In 1853, Henry D—, æt. 25, was admitted under my care into the clinical ward, suffering with intense frontal headache, which he attributed to anxiety and sleepless nights. The pupils were natural. Respiration 28. Pulse 76. Tongue rather dry with brownish fur in the centre. Bowels regular. There was no heat of the head nor any injection of the con-

junctiva. He moved all his limbs freely. For three days there was no other symptom of cerebral disease, but the intense pain in the forehead. He denied that it was more on one side than the other. On the fourth day there was transient delirium, and an occasional effort to vomit. At 4 p.m., on the sixth day, the patient died suddenly and unexpectedly. On the superior part of the right petrous bone, the dura mater was destroyed by sloughing, over a large carious opening in the roof of the tympanum. In the adjacent part of the middle lobe of the brain, there was an abscess containing two ounces of fetid pus. It extended inwards to the descending corner of the lateral ventricle. The brain-tissue around was yellowish, ecchymosed, and softened. It was a matter of surprise to all who saw the case, that with such extensive local injury, beginning from the coverings of the brain, the patient should have made no complaint of pain at the part, but should have referred all his sufferings to the forehead.

In some acute cases a convulsion marks the onset of the inflammatory process.

The frequent latency of the disease and the causes which favour such a course have been alluded it. There may be absolutely no symptoms, and the abscess be only accidentally discovered after the death of the patient from some other cause. This latency, as before remarked, is for the most part only up to a certain point, and then the symptoms attending the accidents of the abscess are suddenly or slowly produced. These vary with the changes in the nervous substance. A local spasm or convulsion; a repetition of convulsions ending in paralysis with or without insensibility; sudden paralysis without convulsion; drowsiness gradually increasing to stupor and coma are some of the varieties.

The beginning of the symptoms from rupture of the abscess into the lateral ventricles has been noticed.

The attendant headache differs from the headache of tumour in being less paroxysmal, and of shorter duration before complications occur with it. The difference of this symptom in the two diseases, tumour and abscess, is to be viewed in relation to the different seats of the two lesions, and to their secondary influence on the brain-tissues. A large proportion of tumours arise in the bones and membranes. Abscess, on the

contrary, principally affects the medullary substance of the brain. This is shown by a comparison of the following tables: that of the seat of tumours is from Lebert;[1] the other includes cases of abscess from Abercombie and Lebert, and those subjoined by myself, excluding from the list the cases of abscess depending upon disease in the ear or in the nose or on other local causes which might determine its site.

Origin of Tumours affecting the Brain and its Membranes.
(Lebert.)

A. SINGLE TUMOURS—		
1. Beginning in the bones	3	
2. Beginning in the membranes—		
Convex surface	13	40
Base	22	
Falx cerebri	3	
Tentorium cerebelli	2	
3. Cerebral substance—		
Convex surface of the hemispheres	17	36
Deep parts of the hemispheres	4	
Protuberance and medulla oblongata	8	
Cerebellum	4	
Pituitary gland	3	
B. MANY TUMOURS—		
Bones only	2	15
Membranes only	2	
Cerebral substance only	6	
Bones and membranes	2	
Membranes and cerebral substance	3	
		94

Seat of Cerebral Abscess not depending upon Disease of the Ear or other parts adjacent to the Brain.

In medullary substance of the hemispheres	15
In corpus striatum	2
In optic thalamus and posterior lobe	1
In medulla oblongata with scrofulous deposit	1
In cerebellum	1
	20

[1] 'Ueber Krebs und die mit Krebs verwechselten Geschwülste, im Gehirn und seinen Hüllen.' 'Archiv für Pathologische Anatomie,' &c., Band iii, 475.

It will be thus seen that in ninety-one cases of tumour (excluding the three cases of tumour of the pituitary gland), the bones or membranes were in fifty-two implicated from the outset of the disease, and that in ten at most was the tumour limited to the deeper parts of the hemispheres. Abscess, on the contrary, is very rare between the membranes, and then only when it arises from local disease of the bone, whilst in fifteen out of twenty cases it was seated in the substance of the hemispheres. It is obvious why, in such an estimate as this, the cases of abscess from diseases of the ear, which are so common, should be excluded; for, although in some cases as remarked below, the abscess of the brain which follows is less from contiguity than from secondary processes, which operate at a distance, still it is difficult in these cases to exclude localizing influences. It is necessary thus to explain, or it might be a matter of surprise that the above table was so limited in its numbers.

The chronic and neuralgic character of the headache in tumour may be in part due to the inequality of its growth as well as to its seat. Abscess would produce a gradual and uniform pressure, which tumour would not.

When a patient is debilitated, the symptoms of suppuration of the brain may be as it were stifled in the general oppression of the nervous system, and the only notice of cerebral lesion, may be paralysis, (often accidentally discovered,) or the occurrence of a gradually deepening coma.

The cases of suppuration in the brain which in their general aspect simulate continued fever, present, on a nearer scrutiny, many distinctive differences, such as occasional vomiting; constipation; contracted abdomen; vertigo; headache, more continued and severe than in fever; a slow, full, and sometimes intermittent pulse; impatience of disturbance, &c.

For the diagnosis of cerebral abscess it is obvious that we cannot hope to find any pathognomonic symptom. Whether the brain-tissue suffer from tumour or abscess or be otherwise compressed and disorganised, we may in turn, and in different cases, expect to have headache, convulsion, drowsiness, paralysis, and coma. Such symptoms considered individually, or as one may say statistically, avail but little in determining the conditions which give rise to them, no more indeed than an

enumeration of the letters and words of an inscription, towards its decipherment. It is their order and duration which gives them their characteristic importance.

The headache of abscess is different both in character and duration from that symptomatic of tumour. It is rarely paroxysmal and neuralgic, as it is in tumour, but more general and uniform in its expression, as well as more sudden in its rise and acute in its progress. Tumours, as we have seen, frequently affect the membranes, and often have a long chronic course; at the onset the pain is also more limited, or takes the course of particular lines of nervous distribution.

Our knowledge of the seat and character of such growths no doubt helps us to appreciate better these degrees of difference, which, like different accents on a word, give a variety of meanings to the same symptom.

General convulsion with insensibility is in itself of but little value in the diagnosis of any brain disease. In abscess it probably occurs only at two stages, at the onset of acute changes in the nervous tissue, especially if such changes begin in the vicinity of the membranes; and at a later period, if the abscess bursts inwards into the lateral ventricle, or extends outwards to the surface. Amongst the subjoined cases is one where the abscess formed between the membranes under the posterior lobe of the right hemisphere. There convulsions occurred early.

Limited convulsion without insensibility has far greater value, not as being absolutely distinctive, since the same often occurs with tumour, but as being to a great extent indicative of local disease; the character of which is to be determined by concomitant conditions and by the other symptoms. Case XIII is such an instance, the clonic convulsion of the right arm without any affection of the consciousness, viewed in relation to the chronic suppuration in the chest, was an indication upon which the diagnosis was made of the presence of abscess in the brain. Abercrombie has described the remarkable course of these cases, the local clonic spasm without insensibility; the gradual supervention of epileptiform convulsion; the paralysis which follows indicating extension of irritation and pressure, more rapid in their course in abscess than in tumour.

Though convulsion may be the first symptom of both

tumour and abscess, there is generally this difference in the course of the two diseases; after convulsion with abscess, the recovery is more or less imperfect, and the patient remains drowsy and oppressed; whilst with tumour, on the contrary, there may be epileptiform convulsions for a considerable time, the patient in the intervals of the seizures recovering almost, if not quite, his usual health.

The pathological order of the symptoms in abscess, as deduced from observation, is headache; local or general convulsion; drowsiness; paralysis; coma. As might have been anticipated, there is no such constancy in the presence or intensity of these phenomena as to make them unequivocal in their indication; and hence, at the bed-side, it is often only by collateral circumstances, and by the known associations of the malady, that we are able to complete the diagnosis.

If it be true, as I believe it is, that with the exception of suppuration produced by scrofulous deposit, idiopathic abscess of the brain does not occur, and that with the exception of that which follows direct injury, it is a secondary result of the suppurative process in some distant part, or of chronic disease about the head, then it is obvious that a scrutiny of every organ is the first step in the diagnosis, or that at least without which the diagnosis cannot be completed. It may often be difficult to trace the suppurative tendency to its source. In one of the cases given below, nothing could be more obscure during life, and after death it was only with some labour that it was ultimately made out to be dependent upon chronic suppuration of the mesenteric glands from ileitis in a debilitated subject. In a case given by Dr. Bright, whitlow was the source of general pyæmia and abscess of the brain. In another case referred to by Lebert, the drawing of a tooth was the first step towards the morbid process. This was followed by inflammation of the upper jaw, ophthalmia, and acute cerebral abscess.

The following is a table of the principal symptoms and causes in the fifteen cases of abscess of the brain given below.

Synopsis of the principal symptoms and causes of Abscess of the Brain in 15 *cases.*

Case.	Sex.	Age.	Symptoms.	Character and seat of the suppuration.	Conditions to which it was referable.
1	Male	25	Two or three restless nights. Severe frontal headache. On the 4th day, vertigo and delirium, with slow pulse. Efforts to vomit. 5th day, cerebral oppression. 6th, paralytic weakness of left side. 7th, coma; death.	Acute abscess in middle lobe of cerebrum on right side. Dura mater sloughing. Petrous bone carious.	Chronic disease of tympanum.
2	Female	23	Severe headache, principally over the right side of the head; pain in the right ear, and frequent vomiting fourteen days. Paroxysms of extreme restlessness. Cerebral oppression. Death on the 17th day. No convulsion nor paralysis throughout.	Diffused suppuration and acute sloughing of the middle lobe of right hemisphere. Dura mater over roof of tympanum sloughing. Bone carious.	Chronic disease of tympanum.
3	Female	20	Paralysis of right seventh nerve, and discharge from the ear, and headache, after a blow. After three weeks headache increased, referred to forehead and occiput. Pain on moving the neck. Rigors; nausea; vomiting; sweating. No delirium. Death from syncope on the 4th day after the increase of the headache.	Abscess in cerebellum. Inflammation of the vein of the aquæductus vestibuli.	Disease of the tympanum following a blow on the ear.
4	Male	43	Sudden lightness in the head, followed, after a short interval, by convulsion and insensibility, recovery, and a second convulsion the same day. On the 3d day headache, increasing to great intensity on the 5th; referred to the right side of the forehead, right temple, and occiput. No delirium. Death on the 8th day, in coma.	Acute abscess in middle lobe of cerebrum on the right side.	Chronic disease of mucous membrane of nose.

Case.	Sex.	Age.	Symptoms.	Character and seat of the suppuration.	Conditions to which it was referable.
5	Male	13	Languor for some days; syncopal seizure. Convulsions with insensibility, relieved by a discharge of pus from the right ear. Following day severe headache from the forehead to the vertex. Nausea. Delirium at night. 6th day, return of convulsions, with insensibility. Intense pain and cramp in left leg. Death in rather sudden coma, 15th day.	Abscess, containing about an ounce and half of pus under the posterior lobe of right hemisphere of the cerebrum, between it and the tentorium. Caries of petrous bone.	Chronic disease of the ear.
6	Male	25	Epileptiform convulsion, followed by apoplectic symptoms lasting several hours. Only partial recovery of memory after ten days. On the 14th day vomiting; increased cerebral oppression. At beginning of 4th week sank into sudden coma, with paralysis of right side. Death on 26th day.	Undefined abscess in posterior lobe of cerebrum on left side.	Dysentery. Chronic abscesses in liver. Recent abscess in lung.
7	Male	43	Symptoms of hepatic derangement. *During apparent convalescence* sudden severe neuralgic pain over left eye. Restlessness. On 3d day defective articulation. Delirium. Gradually increasing coma. Death on 10th day.	Abscess, without definite walls, in anterior lobe of left hemisphere, near the surface. A second abscess, encysted, in the middle lobe on the right side. This had burst through the optic thalamus into the lateral ventricle.	Cause not found.
8	Male	46	Under care for chronic abscess in abdominal walls. Rigor; drowsiness; great muscular debility, especially marked on the left side. Partial paralysis of right side of face. Difficult deglutition; semi-coma. Death on 6th day.	Five abscesses, in different parts of the medullary substance of the right cerebral hemisphere. Abscess in left hemisphere of cerebellum. Abscesses not encysted.	Chronic abscess in sheath of left rectus abdominis muscle.
9	Male	45	Febrile symptoms: frequent rigors; pain, supposed to be neuralgic, in left side of head; sudden hemiplegia, without loss of consciousness; drowsiness. No delirium. Death by general exhaustion at end of three weeks.	Numerous abscesses, not encysted, scattered through the medullary substance of hemispheres; one in the right corpus striatum.	Suppuration of mesenteric glands after ileitis. Abscess in spleen and kidney, not encysted.

10	Male	16	Phlegmonous inflammation of upper lip, extending to the right orbit. Abscess behind the globe relieved by puncture. Pain of an intermittent character over *left* side of the head, extending along the lower jaw and behind the ear. *Apparent convalescence.* Sudden dull heavy pain in head, with vertigo; general convulsions, coma, and death, in about five hours.	Abscess, not encysted, occupying two thirds of the middle lobe of the brain on the right side. Suppuration in orbit of the same side. Sloughing dura mater.	Disease in the orbit.
11	Male	16	Symptoms of typhus in a mild form. Headache, relieved by leeches. *Apparent convalescence.* Sudden insensibility, followed by a succession of epileptiform convulsions. Partial recovery of consciousness. Return of convulsions, followed by hemiplegia of right side. Death in coma after ten weeks.	Large encysted abscess in middle lobe of cerebrum on the left side.	Fall on the back of the head.
12	Female	17	During convalescence from variola, sudden maniacal delirium. Rigor; headache; drowsiness; paralysis of left arm. On 4th and 5th day severe pain in left leg. On 6th, the leg was incessantly moved up and down in bed; sudden coma, and death about noon the same day.	An encysted abscess, which had burst through the right optic thalamus into the lateral ventricle. Two smaller encysted abscesses in posterior third of left hemisphere.	Cirrhosis of left lung, with large suppurating cavities (dilated bronchial tubes?)
13	Male	34	Sudden seizure with vertigo, faintness, and loss of power on right side. No unconsciousness. Complete recovery, and good health for eight months. Sudden clonic spasm of right arm, lasting a few minutes, and returning several times within a few hours. No loss of consciousness. Following day spasm of arm, beginning as before, but the attack soon becoming epileptiform. 4th day, return of epileptiform convulsions, followed by partial hemiplegia of right side, gradually becoming complete. Death after three weeks from second seizure.	Large encysted abscess in posterior lobe of left cerebral hemisphere.	Suppurating cavity in right lung during three years, after pleuro-pneumonia.
14	Male	23	Sudden seizure, with only partial loss of consciousness. A second seizure the same day. After a month a third seizure, followed by impaired memory and general cerebral oppression. In the interval of the seizures, headache and occasional vomiting. Death at end of three months.	Encysted abseess in posterior lobe of left cerebral hemisphere.	Chronic disease of right pleura with external fistulous opening. Dilated bronchial tubes.

Case.	Sex.	Age.	Symptoms.	Character and seat of the suppuration.	Conditions to which it was referable.
15	Male	40	Severe headache, principally frontal; gradual impairment of memory; transient attacks of loss of sight, sometimes with unconsciousness. These symptoms for a year. Subsequently, total blindness; continued headache; partial hemiplegia of left side. Frequent seizures with general loss of muscular power. Drowsiness; semi-coma. Death fourteen months after the beginning of the symptoms.	Two large inflammatory cysts, with surrounding solid exudation in the anterior lobe of right cerebral hemisphere.	Fall on pavement; contre-coup, a year before distinct symptoms of cerebral disease.
16*	Male	42	Mucous discharges from nose for uncertain period. Vertigo and headache five weeks. Seizure in bed at night; insensibility; paralysis of left arm and leg. Death after twelve days.	Softening and ulceration of the convolutions of the under surface of anterior lobe of right hemisphere, extending backwards to the fissure of Sylvius and inferior surface of corpus striatum.	Chronic disease of mucous membrane of nose.

The general symptoms attendant upon the formation and presence of abscess in the brain occur equally in hydrocephalus. In both diseases, acute changes may be going on within the cranium, though the head and extremities remain cool. The altered respiratory rhythm; the slow, occasionally intermittent, pulse; sluggish pupils; vomiting, and constipation, are evidence only of an oppressed medulla oblongata, which may arise from many causes.

Rigors are not amongst the constant symptoms. They appear to be more frequent in inflammation of the lateral sinus, or when pus collects between the dura mater and bone. The nervous tissue yields readily, and hence, probably, the tension which excites rigor is not commonly produced by the formation of pus in its substance.

Our present knowledge of therapeutics leaves us hopeless when suppuration has already taken place in the brain. The practical lesson of a large number of these cases is little more than *principiis obsta.* There is no doubt a bad and a good treatment in the most desperate cases. Could we be sure of the existence of abscess, or of the acute or chronic processes leading to it, our treatment would certainly often be very different from that commonly resorted to. Diagnosis must, however, improve before much can be attempted, and even when our insight shall have become perfect, the peculiarly unfavorable conditions of the disease will remain.

There are no sure criteria of the seat of the suppuration even whilst there is the strongest probability of its existence. The following cases, and the recorded experience of others, show that there may be pain in the forehead, with abscess in the cerebellum, pain in one side of the head, whilst the abscess is in the other hemisphere, and even no symptom but drowsiness, though suppuration is extensive. The not unfrequent occurrence of more than one abscess is also a further complication of the diagnosis. Even where abscess follows injury to the scalp, it is not so entirely under the external wound as to make us sure of evacuating the pus by an incision. Clinical experience shows, however, that the brain-tissue will bear more mechanical interference than might have been supposed, and encourages the hope that as knowledge increases even here, our power may increase with it. Detmold's

case,[1] notorious from the doubts as to its veracity and the subsequent testimony[2] to its truth is a striking illustration. Though life was not ultimately saved, it was prolonged by the surgical interference, and for a time consciousness and reason were quite restored. It might be of the highest importance in a similar case if only this could be effected.

According to Lebert, there is no recorded case of cerebral abscess undergoing the process of cure. It is not improbable that, apart from the fatal tendencies of the malady, the prevalent use of mercurials as remarked upon at the beginning of this paper, may have had its share in this unfavorable history.

[1] The following is an abstract of this remarkable case. A healthy man, forty years of age, received, on July 14th, 1849, a severe blow from a piece of machinery, causing compound fracture of the left frontal bone. He went on well for three weeks, when symptoms indicating pressure came on. These were relieved by removing some pieces of loose bone from the wound. Nine weeks after the accident he complained of headache and became drowsy. The following day he was in a profound stupor, from which nothing could rouse him. Pulse slow; pupils fixed. An abscess was suspected. Some fragments of bone were removed without any improvement of the symptoms. It was then that Dr. Detmold determined to attempt evacuating the pus. On the 13th of September, the cicatrices which had formed over the wound and dura mater adherent to it, were dissected off, and an incision made into the brain beneath, an inch in length and an inch and half in depth. A large quantity of pus flowed out, variously estimated by those present at from two to five ounces. The patient at once recovered consciousness, and answered distinctly that he felt better. The pulse rose from 40 to 60 in the minute. The exposed part of the brain cicatrized, and the patient was able to leave his bed on the eighteenth day after the operation. Three weeks after the operation he began to lose his memory. On the 18th of October, the part from which the bone had been removed had sunk in considerably, encouraging the hope that the cavity of the abscess was closing. There was at this time a return of headache and a slight convulsion. On Oct. 22d, as stupor had again come on, another incision was made into the brain to the depth of an inch and a quarter without any pus being found. The next day a probe was introduced, and to the astonishment of the operator passed four and a half inches deep in the direction of the lateral ventricle, indicating that the abscess had opened into that cavity. After this the patient mended bodily, but entirely lost his memory. It was determined, as a last effort to save him, to lay open the lateral ventricle itself by an incision. This was done, and half an ounce of pus flowed out. The patient died the same evening, seven weeks after the first opening of the abscess. On a post-mortem examination, both lateral ventricles were found to contain pus—the right a larger quantity than the left, this cavity having been in part emptied by the incision made into it before death. The incision had been carried into the roof of the anterior cornu. American Journal of Med. Science. January, 1850.

[2] 'Archiv. für Pathologische Anat. und Physiol.,' 1857.

Case I is given at page 267.

Case II.—*Polypoid growth from inner wall of tympanum; destruction of membrana tympani; caries of petrous bone; sloughing of the inferior half of the middle lobe of cerebrum.*

Sarah C—, æt. 23, a healthy young woman, employed as a domestic servant, had occasional discharge from the right ear from three years and a half old, and was deaf on the same side, but as far as could be ascertained the deafness was not constant. Fourteen days before her death she began to complain of intense pain in the head, and had frequent sickness. She continued, however, to do her work until the 18th of April, 1857, when she came under the care of Mr. Stedman, through whose kindness I had the opportunity of examining the brain. The pain was then on the right side of the head and in the right ear, from which there was a purulent discharge. The pulse was slow and labouring. Her mind quite collected. The following day the symptoms were unchanged. On the 20th, she had paroxysms of extreme restlessness and violent screaming, crying out, "Oh, my head!" There was great cerebral oppression at times, but up to the morning of the 22d, the day of her death, she protruded her tongue when asked to do so, and could speak distinctly. There was no convulsion nor hemiplegia. The pupils were dilated, but unequally so.

Post-mortem examination.—Thoracic and abdominal viscera perfectly healthy; no trace of tubercles. The inferior half of the middle lobe of cerebrum on right side sloughing, ash-coloured, and intolerably offensive. The sloughing extended into the descending cornu of the lateral ventricle, and affected the body of the fornix. The thalamus and corpus striatum were superficially of an ash-gray colour, and softened. A thin offensive purulent fluid infiltrated the sloughing tissue, and was effused into the ventricles; the choroid plexus of the fourth being sodden and discoloured by it. Cerebrum healthy. The dura mater covering the roof of the tympanum and in the situation of the lateral sinus, ash-coloured and offensive, but not perforated. Between it and the bone fibrinous exudation. The lateral sinus contained partially disorganized clots. The roof of the tympanum was destroyed by caries to the extent of a silver threepence, including a large part of the superior semi-circular canal. The vestibule and semi-circular canals contained pus. The cavity of the tympanum was filled with a soft cream-like pulp, which on microscopic examination consisted of granular matter, oil-globules, crystals of ammoniaco-magnesian phosphate, and

fine acicular fatty crystals. The stapes was *in situ*. A polypoid growth attached by a narrow pedicle to the promontory, obstructed the auditory canal. It was fibro-nuclear in structure. I am indebted to my friend Mr. James Hinton for the dissection of the ear.

Remarks.—If Louis' induction be of value, the absence of tubercles from the lungs was in itself evidence against the tubercular character of the disease of the ear in this case. The healthy condition of the thoracic and abdominal viscera, contrasted remarkably with the fearful ravages of the sloughing process in the brain, which had been set up by the contact of the dead and partially decomposed dura mater lying upon carious bone. The obstruction of the external meatus by the polypus, appears to have been the immediate cause of the retention of the exudation in the tympanum, and thus indirectly of this destructive process. Considering the healthy character of the patient in all respects, except the disease of the ear, there is great probability that suitable local treatment would have entirely obviated the course of the malady.

CASE III.—*Inflammation of mucous membrane of tympanum; caries of the chain of bones; displacement of stapes; caries of wall of meatus auditorius internus; inflammatory softening of trunks of auditory and facial nerves; abscess of cerebellum by extension of inflammation through the vein of the aquæductus vestibuli.*

Anna W—, æt. 20, was admitted into Guy's Hospital, under the care of Mr. Cooper Forster, December 31st, 1856, for primary sore, ulcerating condylomata, and vaginitis. It was also observed that she had paralysis of the right facial nerve, of which she gave the following account; 'Three weeks ago one of her companions gave her a severe blow with the hand on the right side of the head. This was followed by discharge from the ear, and a week ago the face became paralysed.' On repeated questioning she denied that she had anything the matter with the ear before receiving the blow. For the first few days after admission, her syphilitic symptoms arrested most attention, but on the 11th January she began to complain of more severe pain in the forehead, extending to the occiput and upper part of the neck. The pain was much increased by rotating the head. She lay on the right side with her head firmly pressed between her hands. No delirium. Complained of vertigo and nausea. Frequently vomited. The day previous she had a decided rigor followed by sweating, and since that time frequent chills and heats. Face and head and extremities cold. Pulse 56, extremely small and feeble, and slightly irregular. No throbbing of carotids. Abdomen collapsed. Constipation. Fetid purulent dis-

charge from right ear. She was treated by leeches and saline purgatives, and the two following days her symptoms remained the same. There was no delirium nor unconsciousness. Frequent moaning complaint of pain in the head, from the forehead to the occiput, and at the back of the neck. There were still frequent heats and chills, and once in the twenty-four hours a sharp rigor and sweating. The pulse remained about 60. Respiration 20, varying in depth and frequency. Early on the morning of the 14th, she was taken with convulsive sobbing without unconsciousness, this lasted for an hour or more, when she became pale, and died without a struggle.

Post-mortem examination.—Membranes and hemispheres of cerebrum healthy. In right lobe of cerebellum near the surface an abscess containing about six drachms of greenish mucoid pus, not fetid. The superficial wall of the abscess was adherent to the dura mater for a small space corresponding to the entrance of the vein from the aquæductus vestibuli. The abscess was limited by a highly vascular cyst. The surrounding nervous substance was œdematous, with a few scattered exudation corpuscles amongst the loosened fibres (inflammatory œdema). The body of the fornix was diffluent and ecchymosed. The lateral ventricles contained four drachms of slightly opalescent fluid. The lateral sinus contained adherent coagula. Both portions of the seventh nerve were soft, and contained exudation corpuscles. There was also slight ecchymosis at the origin of the portio mollis in the floor of the fourth ventricle. The inflammation of the nerve-trunks had probably arisen in part by extension along the sheath, from the internal meatus, and in part from contiguity with the abscess which lay over their course. The membrana tympani in part destroyed. The handle of the malleus separated from the body of the bone by caries; the base of the stapes extensively carious and displaced from the fenestra. The semicircular canals contained a bloody fluid, but the petrous bone was not examined in a sufficiently recent state to admit of an exact account of the contents of the labyrinth. The wall of the meatus auditorius internus carious; a deposit of new bone on the upper and posterior wall of external meatus. The mastoid cells and the sulcus lateralis healthy. The lungs were free from tubercles. The thoracic and abdominal viscera healthy.

Remarks.—This patient asserted that she never had any

affection of the ear before she received the blow upon it. If this was so, the crust of new bone in the meatus must have formed in the five weeks preceding her death, and whilst the ulcerative process was advancing in the tympanum. The subject has a peculiar importance in a medico-legal point of view, since it might become, as perhaps it should have been in this case, a question before a jury whether the blow was the sole cause of death, or whether the deposit of bone was evidence of antecedent chronic disease. Our knowledge of the time within which exudation ossifies, does certainly not appear to contradict the statement of the patient. Admitting it to have been as she said, the immediate local treatment of such a case after the blow, becomes in itself a subject of special interest. It did suggest itself at the bed-side, if it were possible or not for this acute affection of the ear to have arisen from direct contact of the gonorrhœal virus.

The course of the disease in the tympanum in this case supplies another example of the uncertainty of any special diagnosis of the part of the encephalon which may suffer when the ear is affected. The caries and displacement of the stapes appear to have been followed by inflammation of a small vein of the vestibule along which the inflammation extended to the dura mater on the posterior part of the temporal bone, and thence to the cerebellum, whilst at the same time it set up caries of the wall of the meatus internus, and passed along the trunks of the auditory and facial nerves to the floor of the fourth ventricle.

The occurrence of the facial palsy was in this case plainly owing to the extension of disease from the vestibule; it is, however, worthy of note, that this form of paralysis, in affections of the ear, does not necessarily imply so formidable a complication. Not only may it occur from some temporary pressure of exudation in the bony canal, along which the nerve runs in its passage to the posterior part of the tympanum; but in scarlatina, as well as in some other cases, there may be attendant glandular enlargement, compressing the nerve after it emerges from the stylo-mastoid foramen.

The chronic diseases of the ear which set up disease of the brain and its membranes, appear to be still regarded as too exclusively scrofulous in their nature. The cheesy concretion

which fills the tympanum in these cases, and which is assumed to be scrofulous matter, is generally only the debris of epithelium and pus, amongst which are scattered crystals of the ammoniaco-magnesian phosphate with plates of cholesterine and fine acicular crystals, probably of a fatty character (p. 289). The presence of these latter crystals, which in form are not unlike urate of soda, may have given rise to the supposition put forth by some writers on the ear, that the affections of the tympanum are often gouty, but chemical analysis gives no indication of uric acid. For the most part, these chronic diseases begin as common inflammation of the mucous membrane of the meatus, or tympanum ; or when they follow upon measles or scarlatina, they soon assume the ordinary conditions of common inflammation. When the bone suffers it is by ulceration, without undergoing that change of structure which characterises scrofulous caries. A further proof of the non-scrofulous character of many of these cases is the absence of tubercles from the thoracic and abdominal viscera, even though the patients may have reached the adult period of life.

From erroneous views of the pathology of this subject, too little attention is paid to local treatment, except in the hands of the aural surgeon. Accumulated exudation is permitted to keep up irritation and favour the extension of a disease, prejudged at first sight to be scrofulous, and to need only constitutional measures for its relief, when cleanliness, occasional local depletion, and the use of astringents would remove it.

Though local treatment must be often pre-eminent, it cannot be insisted upon exclusively ; for the subjects of such chronic inflammations are, for the most part, feeble and irritable, with fair hair and thin skin, and in whom nutrition often requires for its due performance the aid of medicines, as well as the most favorable hygienic conditions we can obtain.

Mr. Toynbee's remarks on this subject are so important that I cannot but quote them.[1] "There is no doubt," he says, "that as a general rule, an attack of inflammation of the tympanic mucous membrane arising in scarlatina, measles, or catarrh, subsides in persons having a healthy constitution, and it is usually in scrofulous constitutions only that the disease becomes chronic. There are, however, many exceptions to this

[1] Lectures, Medical Gazette, 1855.

rule, and I think I shall make it evident that it is not the scrofulous diathesis of the patient which causes the disease to advance to the brain. As a general rule, to which I have found but few exceptions, the cause of the advance of the disease inwards to the brain appears to be that matter is secreted in one or more of the cavities of the ear, from which it has only a partial egress, or in which it is entirely pent up. Sometimes it is scrofulous matter (?) at others mucus or pus, but whatever may be its nature or wherever it may be situate, I believe that its inability to escape externally is the cause of the progress inwards of the disease." Of the importance of this last remark there can be no doubt, but whether scrofulous concretion does occur under the circumstances alluded to, and if so, whether its removal would produce the same good effect as follows the removal of other accumulations, has yet, perhaps, to be proved.

The same author has endeavoured to give greater precision to this part of pathology, by showing that each of the cavities of the ear has its particular division of the encephalon to which it communicates disease. Thus, inflammation of the external meatus will, with some special exceptions, extend to the lateral sinus and cerebellum; inflammation of the tympanum to the cerebrum, and of the labyrinth to the medulla oblongata. Although the exactness and importance of the anatomical relations pointed out cannot be overrated, and though, as Lebert, in his article on inflammation of the lateral sinus, says, the observation comes from too good a source not to deserve the highest consideration, yet we must demur accepting the pathological deductions until we have more clinical proof that disease in its extension from the ear does observe such direct and exclusive routes as the anatomical relations would imply. In the above case, the disease progressed from the tympanum, in all the three directions indicated, and death occurred from abscess of the cerebellum through phlebitis of the vein of the aqueductus vestibuli. In the case of a young man, recorded by me,[1] the meatus externus and membrana tympana were healthy, yet the mastoid cells, as well as the roof of the tympanum were carious, and acute inflammation of

[1] 'Medico-Chir. Transact.,' vol. xxxviii, p. 158.

the lateral sinus was the cause of death. In another patient, the bony meatus was carious, but disease had extended inwards and destroyed the roof of the tympanum and its posterior wall. Nor are instances wanting of acute disease of the meatus in the adult, setting up inflammation of the brain and its membranes, without implicating the mastoid cells or lateral sinus. When the course of the inflammation in any case is determined, the anatomical relations may enable us to anticipate what part of the encephalon may suffer, as, for instance, if it be towards the mastoid cells, the lateral sinus and cerebellum will become affected, if it be towards the roof of the tympanum the cerebrum will suffer, but they do not enable us to prognosticate from the beginning of a case what that course will be, whether exclusively in one direction, or generally in all. As the routes by which disease of the ear may extend to the brain are three, so are there several modes of its extension. It may be by excessive implication of all the tissues until at length the adjacent portion of brain is involved in the lesion, or it may be by extension along the veins only to the membranes, and thence to the adjacent portion of the brain; or, lastly, abscess may occur in these cases as a secondary process, as it occurs where the primary malady is in some distant part. In this case, the abscesses may be multiple and isolated from disease in the ear by healthy tissue intervening. It is under these circumstances that the original source of the malady is apt to be overlooked and the suppuration to be regarded as idiopathic.

CASE IV.—*Chronic disease of the mucous membrane of nose: acute abscess in middle lobe of cerebrum.*

A gentleman, æt. 43, strong, of good stature, and living at the time of his illness on his own estate in the country, went to church on Sunday morning, January 20th, 1855, in apparently good health. On his way home he suddenly felt a strange sensation of lightness in the head. He felt as if lifted from the ground. As his neighbours passed him and spoke he could not comprehend what they said, and was unable to address them. He reached home safely, and soon recovered so as to be able to describe to his wife what he had felt; but shortly afterwards, when walking across the room, he staggered and fell down insensible and convulsed. The convulsion lasted a few minutes, and when he recovered he assured his friends he felt quite well and that it was only a faintness. During the afternoon, whilst lying on the sofa,

the same sensation of lightness in the head returned again, and a second time he became insensible and was convulsed. Mr. Bottomley, of Croydon, now saw him, and prescribed suitable remedies. The following day the patient appeared quite well, and would take no more medicine. On Wednesday he went to town, and on his return passed a restless night. On Thursday evening headache, of which he had had symptoms on Tuesday, returned with great violence. The pain was over the right temple, and in the occiput on the same side. I saw him first on the Friday afternoon, he was perfectly collected, complained of an agonizing pain in the right temple and over the right eye. Exhibited great restlessness, now burying his head in the pillow, and now pressing it with his hands for ease. He never in his life, he said, so much wished to be well, the pain was so dreadful. Pulse 80, with an occasional intermission. No throbbing of the carotids. Skin cool. Feet cold. Temperature of head rather increased. Tongue moist and nearly clean. The bowels had been relieved during the day. Urine of a pale straw colour without deposits. Pupils small but active. No affection of sensation or motion of any part. Slight nausea. No vomiting. The history I obtained from him and his family was as follows: He had always had excellent health until four years before. He was then living in Australia, and at the time of sheep-shearing took cold in the left eye from a *coup-d'air*. He had then severe neuralgia of the left side of the head and face, lasting three or four days, and since that time returning at intervals. For three years he had had symptoms of polypus nasi, and an attempt had been made to remove one from the right nostril. There was a free watery mucous discharge which had not diminished with the accession of the cerebral symptoms. On the day previous to his seizure he was out shooting. The weather was at the time extremely cold. After his death I learnt that at the end of the year 1853, he had a fall from his carriage, which stunned him for a short time. On the day after my visit, he was seen by Dr. Jeaffreson who found his general symptoms unchanged, except that the pain in the head had extended from the occiput to the upper part of the neck; the pulse varied in frequency, and was sometimes at 50. No vomiting. No anæsthesia, nor affection of motion of any part. Occasional and slight incoherence. He died the following morning in coma.

The post-mortem examination was made by Mr. Bottomley and Mr. Edenborough, by whom I was kindly supplied with the following details, and with portions of the diseased parts of the brain.

In the posterior part of the middle lobe of the cerebrum on the right side was a recent abscess of the size of a small orange. It had encroached upon the deeper layer of the gray matter of the convolutions over it, but had not reached the surface. The lateral ventricles contained a small amount of puriform fluid, but no communication was traced between them and the cavity of the abscess. On removing the brain from the base of the cranium, it was found to be much softened over the sella turcica, with recent inflammatory exudation.

The ethmoid bone was not observed to be carious. The interior of the nose was not examined, nor the viscera of the thorax or abdomen. The pus was without fetor, greenish, and only slightly mucoid. There was no trace of a cyst. The tissue around was softened and vascular.

Remarks.—In the absence of any direct evidence obtained by examination of the interior of the nose after death, that disease existed there which might have occasioned the abscess in the brain, we can only infer the probability of its presence from the clinical history and from the recent exudation about the sella turcica. The absence of caries of the ethmoid would not be any valid proof against it, since it is established that the blood-vessels running through a bone may be the medium of extension of disease, and especially of acute disease, before the bone-tissue becomes carious. In the diseases of the ear there are many recorded examples in proof, and Case XVI, given below, though not one of abscess of the brain, is an illustration of this mode of extension of disease from the nose to the contents of the cranium. When that case occurred my colleague, Dr. Wilks, spoke to me of a patient of his who had had a mucous discharge from the nares, and rather suddenly become the subject of acute meningitis. On a post-mortem examination the membranes on the under surface of the anterior lobes were adherent by recent lymph. There were no tubercles nor any other obvious exciting cause of the meningitis, and at the time the meningeal inflammation was attributed to cold, but from the history of Cases IV and XVI it was probably only another instance of the course of morbid action indicated above.

CASE V.—*Chronic thickening of lining of external meatus and tympanum; ulceration of membrana tympani; cavity of tympanum filled with soft cheesy concretion; caries of petrous portion of temporal bone; inflammation of right lateral sinus; abscess on the surface of the posterior lobe of the cerebrum.*

George O—, æt. 13, one of the boys in the Licensed Victuallers' school, complained occasionally of pain in the right ear from which there had been a purulent discharge, according to his mother's account, since he was a few months old. On the 29th May, 1854, the pain in the ear was more severe than usual, and whilst standing in his class in the afternoon he suddenly became faint. During the night

he was severely convulsed, and in one of the paroxysms pus is said to have been freely discharged through the nose with immediate relief of the symptoms. June 1st, he had no evident cerebral disturbance. Pulse 96. Action of heart sharp but feeble, with irregular rhythm. Pupils dilated. Sight unaffected. On the 2d, he made great complaint of pain across the forehead and towards the vertex, and his manner was tremulous. Slight confusion on waking. Nausea but no vomiting. Pulse 74, irregular. Respiration 24. On the 3d, whilst out of bed, the convulsions returned. On the 5th, after a restless and delirious night, the pulse fell to 40, with a peculiarly sharp beat. Respiration 24, very irregular in rhythm and extent, being sometimes thoracic and sometimes abdominal. Frequent alternations of flushing and pallor. Abdomen flattened. Evacuations dark and slimy. With the complaint of pain in the forehead, he also made singular complaint of formication in the toes, and up to the hip in the left side. The following day the muscles of the leg became frequently cramped, and especially those of the great toe. From this date to the 11th, his symptoms underwent no important change. The pain in the head was severe, and principally referred to the forehead. On awaking from sleep his manner was frightened and confused. On the 11th, he complained very much of pain and formication in the left foot, over the instep and up the leg, it was felt slightly also in the arm. The pulse ranged from 70 to 80. The respiratory rhythm was often remarkably irregular so as to defy any trustworthy statement of it for short intervals. The skin was hot and dry. Tongue slightly furred and protruded steadily. No vomiting. The ear continued to discharge freely. Towards the morning of the 12th, he became rather suddenly comatose, and died in about half an hour without convulsion.

Post-mortem examination.—The convolutions of the middle and posterior lobes of the right hemisphere of the brain were flattened, and there were traces of recent inflammatory exudation in the sulci under the arachnoid. On lifting up the posterior lobe from the tentorium an abscess was opened containing about an ounce and a half of pus. This abscess was irregularly bounded by the compressed convolutions, the falx major, the tentorium cerebelli, and the dura mater covering the petrous bone. It had not penetrated through the close arachnoid, but the subjacent brain-substance was softened, and of a faint gamboge tint. The lateral ventricles and central parts were healthy. No increase of ventricular effusion. The base of the brain and cerebellum without any traces of disease. The right lateral sinus thickened, the lower third obstructed by old coagulum, which apparently had formed slowly and was in part decolorized; the upper two thirds contained recent fibrin and pus. The external surface of the dura mater in contact with the middle and inferior third of the sulcus was much injected, and the subjacent bone rough-

ened, only a very thin shell remaining of the posterior wall of the tympanum. The superior surface of the petrous portion forming the roof of the tympanum was ulcerated into a hole as large as a goose-quill. The tympanic cavity was full of a soft, cheesy, yellowish concretion. The lining membrane thickened, and near the opening of the Eustachian tube it was villous from delicate vascular folds. The posterior wall was excavated by ulceration. The contents of the cavity consisted of epithelium, granular matter, fat globules, and crystals of cholesterine.

A. Cheesy concretion from tympanum, containing—
β. Crystals of cholesterine.
γ. Other, fine acicular, fatty crystals.

The Eustachian tube was healthy. The membrana tympani in great part destroyed by ulceration. The outer bones of the chain destroyed. The lining of the meatus much thickened. The viscera of the chest and abdomen were all healthy. No traces of tubercle.

Remarks.—The thickening and villosity of the membrana tympani appeared to be due to common inflammation. In its recent state, the membrane had much the appearance presented by chronic disease of the synovial membranes, when the formation of vascular fringes attends the ulcerative process. The bone had undergone a clean process of ulcerative absorption without any preceding infiltration of its structure. The occurrence of inflammation of the lateral sinus with ulceration of the roof of the tympanum and abscess above the tentorium, seem to show that the preponderance of the morbid action in the one direction or the other, whether towards the cerebrum or the cerebellum is, as stated above, fortuitous. The disease probably began at the superior and inner portion of the meatus, extended through the membrane to the roof and posterior part of the tympanum, and backwards to the superior

part of the sulcus lateralis, the floor of which was carious for more than two thirds of an inch.

In the report of the case it is stated that a discharge of pus through the nose gave relief to the symptoms for several days. At the bed-side it was thought likely that there might be some communication with the suspected suppuration within the cranium, but this was proved not to have been the case as the dura mater was not perforated. It is, therefore, probable that the accumulation in the tympanum, which may have directly compressed the dura mater through the carious opening in the roof of the cavity, was thus relieved.

CASE VI.—*Chronic abscesses in liver probably set up by an attack of dysentery; recent abscess in left lung; large undefined abscess in brain.*

Thomas D—, æt. 25, sailor, was, in 1853, engaged in boat-service in the Burmese war, when he fell ill with fever and ague, and was invalided for seven weeks. On his passage home to England, at the end of the year 1854, he was seized with pain in the left side, occasionally extending to the right. This was attended with cough, shortness of breath, and hæmoptysis. He was admitted into Guy's Hospital, under the care of Dr. Hughes, February 14th, 1855. His symptoms at that time were cough with expectoration of thin mucus; pain on deep inspiration, and tenderness on pressure in the right hypochondrium, which was rounded and prominent; morning sweats; urine high coloured and depositing urates; no icteric tinge of skin or conjunctiva. Dulness on percussion over right mammary and lateral regions of the chest with absence of respiratory sound, tactile vibration remaining distinct. Chronic abscess of the liver was diagnosticated. In the afternoon of the 21st, whilst conversing with one of his fellow-patients he suddenly fell down convulsed. When seen shortly afterwards the eyes were open, pupils widely dilated and fixed, breathing stertorous, with puffing of the cheeks in expiration. The tongue had been bitten. The urine passed involuntarily. The skin was sodden with perspiration. Pulse 116, These symptoms continued for several hours, and induced some who saw him to think that an extensive effusion of blood had taken place into the ventricles. In the evening, five ounces of urine was drawn off by the catheter and found to be highly albuminous. The following day he was semi-comatose. Pupils dilated. Pulse 92. A pint of urine now drawn from the bladder, was not coagulable by heat or nitric acid. Sp. gr., 1025, large deposits of urates on cooling. On the 23d, he had sufficiently recovered his consciousness to be aware of the pain of the blister which had been applied to the back of the neck. During the week following, there was singular incoherence without delirium. His expression was vacant, and when he attempted to answer questions he frequently gave an unintelligible jargon or repeated words over and over again. There was no paralysis. On the 3d of March, he answered questions correctly but with hesitation; said his memory was returned, and that he was no longer "so silly" though at times he had vertigo and mental confusion. On the

7th, he had headache and vomited. Pulse 88. On the 9th, the brain was again much oppressed. He could tell his name but not his age; this he tried to arrive at by enumerating the epochs of his life—as, I was so old at such a time, and so old at another. On the 12th, he vomited several times. On the 14th, the same mental confusion continued; instead of saying he has pain in his head, he says he has "pain in his pain." He does not recognise familiar objects though he sees them. When told to protrude his tongue he draws it back into the mouth. Hands tremulous. Pulse feeble. On the morning of the 16th, he sat up in bed and drank some tea, but did not speak. An hour afterwards he was found lying on his back comatose. The right arm and leg paralysed. Both pupils dilated, the left the larger. Pulse feeble, 60. Respiration 28, entirely thoracic. Stertor with occasionally a deep sigh. During the two days following there was no important change in his symptoms. The pupils varied much within short intervals, probably from changes in the circulation as shown by the alternate flushing and pallor of the face. Optic axes divergent; eyelids not closed. Conjunctiva on right side congested. The only traces of consciousness were in the movements of the left arm, which he often put to his head or used to replace the bed-clothes when disturbed. Died March 19th, twenty-six days from the onset of the cerebral symptoms.

Post-mortem examination.—Cranial bones, dura mater, and sinuses healthy. On removing the calvaria, an abscess was at once obvious at the surface of the posterior lobe of the left hemisphere, breaking through the cineritious substance. The cavity of the abscess was undefined. It contained about an ounce and a half of greenish mucoid pus, not fetid. The surrounding cerebral substance, including the whole of the middle lobe of the cerebrum, was softened and yellowish, from infiltration of inflammatory products. There had been hæmorrhage from the anterior and outer wall of the abscess, forming a coagulum as large as a walnut, which was partially mixed with the pus. The left lateral ventricle was full of pus, which had escaped from the abscess through a rent in the posterior cornu. The right was distended with about an ounce of clear fluid. At the base of the brain there were tender filaments of recent lymph between the two surfaces of the arachnoid. The left crus cerebri was slightly softened. Old and recent adhesions at the bases of both lungs.

An abscess of the size of an egg, filled with mucoid pus, in lower lobe of left lung; tissue around consolidated. Base of right lung in an early stage of pneumonia. Mucous membrane of colon thickened, and slate coloured. In many parts, well-marked cicatrices of old ulcers. The calibre of the gut unequal. No existing ulceration. In right lobe of liver, two

chronic encysted abscesses, each as large as a duck's egg, one on the upper surface, the other in contact with the kidney. The cysts were remarkably thick and tough, they contained greenish mucoid pus, not fetid. The cyst of the deeper seated abscess was at one part softened and there was recent inflammation in the secreting texture adjacent.

Remarks.—In this case, one of the chronic abscesses in the liver appears to have become, by recent inflammation of its sac and of the adjacent structures, the source of secondary abscess in the lung and brain. From the nearness of the abscess to the surface, it may be inferred that the sudden and severe convulsion which was the opening symptom of the cerebral affection, was connected with membranous irritation, traces of which existed as tender filaments of adhesion between the two surfaces of the arachnoid.

The sudden seizure on the fourth day before his death may have been connected with the unusual accident of hæmorrhage into the abscess, rather than with the rupture of it into the lateral ventricle. The progress of the abscess inwards towards the posterior cornu appears to have caused ventricular effusion, which filled the right ventricle, whilst the left was full of the pus which had recently been poured into it from the abscess.

CASE VII.—*Encysted abscess in middle lobe of right hemisphere; undefined abscess in anterior lobe of left.*

J. S—, æt. 43, farm labourer; light hair; florid complexion; muscular. Had symptoms attributed to inflammation of the liver, from which he convalesced. On the first day of his return to work, the weather being hot, with a bright sun, September 13th, 1844, he was seized with severe pain over the left eye at the supra orbital notch. He passed a restless night, and the following day the pain was unabated. He said he could cover the painful part with his thumb. Pulse 72. Tongue clean. Skin cool. Bowels open. The case was treated, as one of neuralgia, with quinine. On the third day there was no improvement; he was drowsy, and the articulation defective. He was now purged, leeches were applied to the forehead, and a blister behind the ear. Calomel and antimony given every four hours. On the seventh day he was drowsy, but could be roused, and answered questions rationally. Articulation more confused—for "sleep" he said "spleep." Occasional incoherence. Sight of left eye dim. He was bled to twenty ounces. This was followed by profuse perspiration, and the pulse rose to 72. On the eighth day he was semi-comatose. Cupped to six ounces. Inunction of mercurial ointment. On

the tenth day, comatose. Several severe tremors (convulsions?) during the night. Pulse small and frequent. Constipation for three days. Arteriotomy to six ounces. Leeches to the head. A mimin of croton oil every two hours, and ten grains of calomel with each dose. Died on the eleventh day.

Post-mortem examination.—The body that of a fine stout man. Abdominal viscera healthy, with the exception of traces of recent inflammation of liver. Left lung universally adherent; right lung only partially so. Dura mater firmly adherent to the calvaria. An abscess without definite walls, containing about three drachms of pus in the posterior and outer parts of of the left cerebral hemisphere, near the surface. The surrounding cerebral substance soft and pulpy. In the middle lobe of the right side, an encysted abscess, with firm, membranous vascular walls. This had burst through the softened optic thalamus into the lateral ventricle.

Remarks.—For this case I am indebted to my friend Mr. Brickwell, of Sawbridgeworth. The early symptoms of hepatitis may have had their origin in cerebral irritation from the presence of the encysted abscess. This must have been for some time latent. Traces of capsulation have not been found earlier than the third week. A cyst as firm and vascular as that here described would have required five or six weeks at least for its formation. It may have been latent much longer than this period. It is notoriously difficult in many cases to determine whether certain symptoms have a cerebral or a gastric origin. Biliousness is often a prominent feature in the account patients give of the early indisposition in any cerebral affection.

The intense neuralgic pain over the left eye, which ushered in the fatal attack, and which was probably a symptom of the acute abscess in the left hemisphere, was noticed also in Case IV, and, at the outset, led to a similar error in diagnosis. The pain was so intense and so limited, and had followed in that case so immediately after exposure to intense cold in field-sports, that its neuralgic character was quite deceptive.

The occurrence of an acute abscess in conjunction with one encysted, is in this case ambiguous. They may have arisen from some common source not discovered at the post-mortem examination, as in the ear or nose. Or the former may have arisen as a secondary (phlebitic?) result of the latter. This

origin seems more probable, since recent changes had taken place in the cyst leading to its rupture, and to softening of the adjacent thalamus.

Case viii.—*Abscess in sheath of left rectus abdominis muscle; abscesses in brain and cerebellum.*

Richard F—, æt. 46, labourer, applied at the hospital as an out-patient under my care, 13th of November, 1854. Complained of being generally unwell, and weak, and of a swelling near the superior attachment of the left rectus abdominis muscle, which, on examination, was found to depend upon a chronic abscess in the sheath. He had been unwell for a fortnight, but had observed the swelling only three days. He could give no account of any exciting cause. The pulse was 100. Tongue furred. Herpes about lips. Urine high coloured and albuminous. He was admitted into the hospital under the care of Dr. Addison, and the abscess was opened the same day. No symptoms occurred to arrest particular attention until the 17th, when the face was observed to be paralysed on the right side, and the same day he had a well-marked rigor. He appeared to be much debilitated, and had mild typhoid symptoms. On the 18th, deglutition, was difficult, and his speech indistinct. There was no decided paralysis of the extremities, but he was remarkably powerless, the left side being apparently weaker than the right. He lay from day to day in a semi-comatose condition, from which he could be partially roused. Urine and fæces passed involuntarily. Almost total inability to swallow. Skin hot. Pulse 96. Towards the end the breathing was stertorous, with loud moaning. He died November 23d, six days after the onset of the cerebral symptoms.

Post-mortem examination.—No wound or scar on the body, except that into the sac of the abscess in the sheath of the left rectus muscle. The integuments of the head and the calvaria healthy. The convolutions of the right hemisphere flattened. The surface of the arachnoid greasy. Exudation of plastic matter in the course of the large veins, between the convolutions. In the anterior part of the right hemisphere, near the surface, was an abscess, containing about three drachms of greenish fetid mucoid pus, and on the same side, more deeply seated in the white substance, and more posteriorly, were four other smaller abscesses containing pus of the same character. They were all defined by a slight circle of injected vessels, outside of which the nervous tissue was normal. The contents, examined by the microscope, showed but few well-formed pus-cells, the larger amount consisting of granular matter. The lateral ventricles were healthy, as were also the corpora striata, thalami, crura cerebri, and pons

Varolii. In the left lobe of the cerebellum was a fifth abscess, situate so near the under surface, that its contents were discharged by removing this part of the brain from the cranium. The sinuses of the dura mater and the bones of the base healthy. Thoracic viscera healthy. Liver rather pale. On its superior surface, near the anterior border, the tissue was softened at two spots, from recent inflammation. The splenic tissue was mottled. In neither of these viscera was there any purulent formation. Kidneys healthy. Bladder thickened. A circular stricture of the urethra about an inch from the meatus.

Remarks.—According to the prevalent theory of the secondary deposits in pyæmia, the lungs ought to have suffered before the brain in this case, provided, as was most probable, that the exciting cause of the secondary suppuration was the abscess in the sheath of the rectus abdominis. Case IX suggests the same criticism, and, as before remarked, even more obviously than this one, since there the infected blood had to traverse both liver and lungs before it reached the brain, and produced its morbid effects.

It is a characteristic example of the insidiousness of pyæmic suppuration in the brain. Slight facial paralysis was the first symptom. But for this and the occurrence of a rigor, there was little to distinguish the case from one of ventricular and sub-arachnoid effusion in a subject debilitated by chronic disease.

CASE IX.—*Peyer's patches in lower portion of ileum, prominent and slate coloured. Chronic suppuration of the mesenteric glands. Many abscesses in brain. Abscess in right kidney and spleen.*

A gentleman, æt. 45, above the middle height, originally of rather a delicate constitution, which had been weakened by a too laborious and anxious city life, as well as by neglect of regular meals, and absence from the use of all fermented liquors, was at the end of February 1857, taken with febrile symptoms, accompanied with a rigor which returned about every twenty-four hours. The homœopathic practitioner under whose care he was, supposed it to be a case of ague. In a few days the rigors became more severe, and were followed by intense neuralgic pain in the right side of the head and face. After one of these attacks, about ten days from the commencement of his symptoms, he was suddenly stricken, whilst shaking hands with a friend, with paralysis of the left side, including the face. There was no un-

consciousness, and though the speech was affected, he was still able to express himself so as to be understood. The rigors continued to return at irregular intervals of one, two, or three days. After each the sweating was profuse. On two occasions there was hiccup lasting for many hours. He was often drowsy, but never had headache, nor delirium, nor incoherence. At my visit, a few hours before his death, I found him perfectly collected, and on my asking him if he had pain in the head, he replied in the negative. His expression was tranquil. Pupils natural. The left arm and leg quite paralysed; the muscles flaccid and wasted. Tongue protruded to the left, its surface dry and brown. Abdomen flat. Urine and fæces had passed involuntarily for ten days. Pulse 130, feeble. On inquiry as to any cause which could have given rise to suppuration in the brain, which from the symptoms was suspected, nothing but negative evidence could be elicited. From boyhood he had often complained of a painful tightness over the forehead, and when fifteen years old, had rather a severe fall. He died on the 17th of March, soon after my visit, fifteen days from the paralytic seizure, and three weeks from the onset of the fever and rigors.

Post-mortem examination.—Body emaciated; muscles of left side especially wasted, and without the rigor mortis which existed on the opposite side. Under the arachnoid of the upper surface of the hemispheres several spots of ecchymosis, one as large as a florin. The middle third of the right hemisphere down to the corpus striatum was softened, leaving no distinction in the affected convolutions between the cortical and medullary structures, the whole being of a yellowish-grey colour, and of the consistence of cream. Amongst the softened portion there were recent dark coagula, and a defined but not encysted abscess, as large as a filbert. Throughout the medullary substance of both hemispheres there were numerous spots of suppuration, from the size of a hempseed to a pea, defined, but not encysted, looking like drops of pus deposited in healthy nerve-tissue. One of these abscesses, as large as a horse-bean, was seated in the inner gray nucleus of the right corpus striatum. The other parts of the brain and cerebellum were healthy. In the diplöe of the part of the calvaria removed, there were some spots of venous congestion visible through the inner table. In the centre of one larger than the rest the bone was softened, and there was pus in the cancelli. The ethmoid and temporal bones and tympana healthy. Hypostatic engorgement of lungs; heart flabby; liver healthy. Two collections of pus, each the size of a hazel nut, in the spleen, and one in the cortical portion of right kidney. The mesenteric glands corresponding to the lower

portion of the ileum were enlarged and slate-coloured, and several in a state of suppuration apparently chronic. Peyer's patches prominent, and mottled by slate-coloured dots; no ulceration. The coats of the small intestine at other parts were remarkably thin.

Remarks.—The prominence and colour of Peyer's patches in the lower part of the ileum were indications of some prior attack of ileitis. Of the occurrence of this, no other evidence could be obtained. The enlarged and suppurating glands of the mesentery corresponded to that part of the ileum so affected. The patient was a feeble person, in whom it might have been expected that local disease would extend. It is remarkable that with such extensive diffusion of the suppurative action in the brain there was never any headache nor delirium. The occurrence of the paralysis, as in many other forms of softening, was quite sudden. The rigors may have been referable to the suppuration under the capsule of the spleen and in the kidney, as well as to that in the brain.

CASE X.—*Phlegmonous erysipelas of upper lip extending to the orbit; suppuration behind the globe; ulceration of the dura mater; defined abscess in anterior lobe of cerebrum.*

W. R., æt. 16, a delicate boy employed in the stables at the South Eastern Railway, came under treatment at the beginning of May, for phlegmonous erysipelas of the upper lip and right side of the face, which he ascribed to inoculation from an unsound horse. The inflammation extended to the forehead and eyelids. Abscess formed in the right orbit, and the globe protruded. There was pain in the *left side* of the head, radiating from a little behind the anterior fontanelle. A quantity of thick creamy pus was evacuated from the orbit by puncture, and the pain over the left temple was, for a time, completely relieved. The eye gradually returned to its place, the chemosis abated, and almost all inflammatory appearances in it slowly subsided. He did not, however, recover his sight, though he gradually began to perceive a yellow-coloured light. The pain over the left side of the head returned a second time, and extended down behind the left ear, and along the lower jaw. It was somewhat intermittent. No disturbance of the intellect. No paralysis, nor any symptom, except the pain, to indicate disease of the brain. He improved in flesh and strength. The headache lessened, and at times, almost left him. At the end of three weeks he seemed to have regained his usual health. Whilst walking in his garden in the afternoon, about five oclock, he complained of a dull, heavy feeling in the head, with vertigo. This went off after he had rested a little, and excited no alarm.

At 8 p. m. the same evening, he suddenly fell into general convulsions, which

lasted half an hour, leaving him comatose. The convulsions returned after a short interval, and he died an hour and a half after the commencement of the first fit.

Post-mortem examination.—On lifting up the brain from the base of the cranium, the membranes were found matted together on the right side over the inferior surface, near the fissure of Sylvius. The dura mater, where it covered the back of the orbit, was perforated by an opening communicating in one direction with the pus in the orbit; and in the other, leading into an abscess in the middle lobe of the brain. Nearly two thirds of the middle lobe were involved in the inflammatory process. The pus was not circumscribed by a cyst, but surrounded by softened brain, outside of which there was induration, and beyond this again, softening and hyperæmia.

Except slight flattening of the convolutions, and general fulness of the vessels, (probably due to death by coma), no other morbid appearances were noted.

Remarks.—The above case was kindly sent me by my friend Mr. Frederick Moon, under whose care it occurred. One of the points of interest in it was the seat of the pain in the head, which the patient always complained of on the left side, although the suppuration was in the right hemisphere. A somewhat similar case, as regards the origin of the suppuration, was under the care of Mr. Birkett, in May, 1854. A man, æt. 46, was admitted for slowly extending (malignant,) ulceration, involving the whole side of the face and orbit. His principal symptom was headache. An encysted abscess of the size of a hen's egg and containing fetid pus, formed in the middle lobe of the cerebrum, and extended inwards to the lateral ventricle, which contained pus. The dura mater was involved in the external ulceration, and the membranes were generally inflamed with considerable sero-purulent effusion over both hemispheres.

In this case, the abscess was evidently of some date, and had formed apparently as an isolated and secondary result of the ulceration on the face, as it might have done had the primary disease been in a more distant part.

CASE XI.—*Fall backwards from a cart; immediate effects overlooked; after a fortnight symptoms of continued fever; partial recovery; sudden insensibility and convulsions; hemiplegia of right side. Death ten weeks after fall. Abscess in left hemisphere, and in sphenoidal sinus.*

Francis L—, æt. 16, a delicate boy, was admitted into Guy's Hospital, December 23d, 1844, with symptoms supposed to be due to an attack of typhus in a mild form. For the first fourteen days the case did not attract particular attention, and appeared to be progressing favorably. January 7th, he complained of pain in the head, which was relieved by leeching and blistering. On the 18th, he was considered convalescent, and walked about the ward. He went on well until the 24th, when he was found in bed insensible. The eyes were open and fixed; mouth drawn to left side; convulsive tremor of hands and legs, followed by a succession of epileptiform convulsions, lasting for three hours, after which he lay for some time as in a profound sleep. On inquiry of his friends it was found that three weeks previous to his admission into the hospital he had slipped and fallen backwards from a cart, striking his head on the ground, and being stunned for a minute or two. There was neither wound nor bruise perceptible. For a fortnight following the accident he complained of nearly constant pain in the back of the head, and was generally indisposed, but not so unwell as to prevent his following his employment. At the end of the fortnight the pain in the head was more severe, and he had chilliness, languor, and loss of appetite, and was sent to the hospital as a case of fever. On the day following the convulsions (January 25th), he was partially sensible, seemed to comprehend what was said to him, but made no attempt to speak. He had a puzzled, confused expression, but protruded the tongue when told to do so. Pupil contracted, but obedient to light. Urine and fæces passed involuntarily. During the next two days he became more sensible, and on the 28th, spoke, and complained in a general way of pain in the head. On the 30th, he vomited, and from 9 a.m. to 2 p.m. had a series of epileptiform convulsions, after which he lay in a state of coma. On the 31st, he sat up in bed, and put out the tongue when told, but did not appear to recognise his friends, nor could he be made to speak. The right arm and leg were completely paralysed. The tongue was pointed to the right; face occasionally drawn to the left. When the left arm was lifted up, it remained for some time unsupported in that position, as in catalepsy. Breathing natural. Pulse feeble and quick. Gums affected by mercury. Towards morning, February 1st, he was for a short time violent and excited in manner. During the day it was noticed that the face was less paralysed, and that he could to some extent move his right arm. He answered questions in monosyllables, and talked incoherently to himself. When the tongue was protruded he seemed to forget to draw it into the mouth again. His expression was remarkably vacant. He sat up in bed by himself, and was incessantly catching at imaginary objects about his dress. A careful scrutiny was made of the head, with the view of trephining, but no trace of any wound or bruise could be detected. All medicines were omitted, and the *ferrum candens* applied to the vertex. For the next few days there was no important change. He occasionally vomited, without any apparent cause, and started up in bed agitated. The pulse was about 60. He

had a stupid oppressed look, but was not insensible, and could articulate slowly, with tolerable distinctness. From the 8th, he became semi-comatose, and could be only partially roused. No stertor. Pulse 60. The food placed in his mouth remained unmasticated. A succession of convulsions came on during the night of the 10th, and he died early the next morning, about ten weeks from the accident.

Post-mortem examination.—No marks of injury were perceptible either upon or within the cranium. The cerebral convolutions were flattened. The arachnoid membrane dry. The vessels congested. The lateral ventricles contained an excess of fluid. In the left hemisphere, a little below the level of the corpus callosum, was an encysted abscess, containing between two and three ounces of serous fluid, in which there was a sediment of greenish-yellow, thick pus, whilst flocculi of lymph floated above it. The wall of the abscess was formed by a well-organized false membrane, having internally a smooth mucous surface. The abscess encroached on the corpus striatum and thalamus opticus. The cerebellum and other parts of the brain healthy. The processus olivaris of the sphenoid bone was carious, and around it, there was a deposit of new bone. Under this part of the cranium, in the sphenoidal sinuses, was a symmetrical abscess, encysted like that in the brain. It had no communication with the cavity of the cranium. Heart healthy. Pneumonic consolidation of the posterior parts of both lungs. Calcareous deposit in the bronchial glands. Intestines glued together by old adhesions. Other viscera healthy.

Remarks.—Injuries to the head, as in this case, are a fertile source of, so-called, idiopathic cerebral abscess. The subject presents difficulties which cannot be altogether surmounted. In the routine of life there will always be, on the one hand, a forgetfulness of such events as these, if they do not lead to immediate results, and on the other, an acute remembrance of trifles, however absurd, which happen to be associated with the beginning of any symptom. These failings of human nature will perplex us at the bedside in proportion to our want of clinical experience in the particular cases under consideration. This alone can tell us the value of negative evidence. The peculiar course of cases like the above has been already remarked upon, and the chief points of difference from continued fever enumerated.

CASE XII.—*Cirrhosis of left lung, from pleura-pneumonia in Childhood. Dilated bronchial tubes. Encysted abscesses of brain.*

Jane T—, æt. 17, a thin, delicate girl, dark hair, rather sallow complexion, never had menstruated, was, on several occasions, from the age of fourteen, an out-patient of Guy's Hospital, under my care, for cough and purulent expectoration, with occasional hæmoptysis. When three years old, had measles, with pleuro-pneumonia of the left lung; this was followed by hooping-cough. Flattening and general contraction of the left chest resulted, with the ordinary signs of obliterated pulmonary tissue and dilated bronchial tubes. On the 27th of January, 1855, she sickened with variola, which assumed a semi-confluent form. In the stage of maturation the habitual cough became more severe, and the expectoration was increased. On the 14th of February, she appeared to be convalescing favorably, except that her manner was rather dull, and she complained of headache. During the 15th and 16th, there was no noticeable change. On the 17th, she became delirious, and left her bed, thinking her room was on fire; her mother found her sitting on the stairs, cold and faint. After being put to bed she had a well-marked rigor, and complained of increased headache. On the 18th, the left arm was observed to be paralysed; she could move the leg on the same side readily, and the face was unaffected. There had been no convulsion. Her manner was dull, but when urged to speak she could answer intelligibly. Pulse 84. Constipation. During the 20th and 21st, she complained of great pain in the left leg, and early on the 22d, began to move it incessantly up and down in bed, the left arm remaining motionless. The constipation persisted, notwithstanding the repeated administration of purgatives, during three days. About noon she rather suddenly became comatose, and died the same day.

Post-mortem examination.—On removing the calvaria and dura mater, the convolutions on the right side were seen to be flattened as by pressure from within. The minute vessels of the pia mater on both sides were congested. The right lateral ventricle contained three drachms of greenish mucoid pus, without smell, which had escaped from an encysted abscess occupying the whole of the right optic thalamus, and pressing upon the adjacent corpus striatum. The body of the fornix and septum lucidum were softened and broken down. In the posterior third of the left hemisphere were two smaller encysted abscesses, containing each about a drachm and a half of pus. The wall of the cyst of the larger abscess was from a line to a line and a half thick. It consisted of fibro-cellular tissue. The inner surface smooth, like mucous membrane, highly vascular, of small, irregularly dilated, meandering veins.

α. Contents of abscess.
β. Fibre-cells of cyst.

The brain-substance around was softened, apparently from œdema only, no exudation-cells being discovered amongst the loosened nerve-tubules. The bones of the head and the sinuses of the dura mater were healthy. The left lung was universally adherent, and only with much difficulty removed from the chest; it weighed fourteen and a half ounces, and sank in water. On section there were irregular cavities throughout it, communicating with the bronchi (dilated tubes); these were lined by a delicate membrane of a dark venous colour, continous with the vascular lining of the bronchi. Three of them were of considerable size, one near the apex being as large as a hen's egg. The pulmonary tissue was entirely destroyed, and replaced by a dense fibrous structure, incorporated with the thickened pleura. The right lung was healthy, as were also the abdominal viscera. No trace of tubercle.

Remarks.—The latency of the abscesses in this case and their relation to the chronic disease in the chest, have been referred to above. The occurrence of smallpox may have been a determining cause of augmented activity in the cysts, and may thus have promoted the fatal termination; but there is no probability, as before stated, that the smallpox had part in exciting the suppuration, since this must have been long antecedent to the operation of the variolous poison. This and the two following cases are instances of a similar association of chronic disease of the chest with cerebral abscess.

The doctrine of final causes, so freely quoted by modern pathologists in explanation of morbid phenomena, receives a shock from the facts of cerebral abscess. Whatever "efforts of nature" the course of abscess elsewhere may seem to show, we can recognise in its course in the brain but mechanical principles, according to which the yielding is in the direction of least resistance, and the pus thereby slowly makes its way towards the cavity of the lateral ventricles irrespective of the well-being of the individual.

The sudden accession of delirium was probably brought on in this case by such an accident. In a similar case, recorded by Abercrombie (Case XLI), a man, æt. 43, had for ten days complained of headache, but was still able to follow his employment. Early one morning he was seized with palsy of the

left side of the face, and became unmanageable. The pupils were contracted and the eyes in perpetual motion. He made the most powerful resistance against being bled. He died on the fourth day. Three encysted abscesses were found in the brain, the largest of which had burst into the lateral ventricle.

CASE XIII.—*Pleuro-pneumonia of the base of right lung, followed by fetid expectoration. Death after three years, from encysted abscess in the brain. Cavity in lower lobe of right lung, with several bronchial tubes opening into it.*

A gentleman, æt. 34, tall and well proportioned, with light hair and fair complexion, was in good health until December, 1853, when, from exposure to cold, he had an attack of acute pleuro-pneumonia of the lower lobe of the right lung. In March following, the symptoms returned, and he began to expectorate muco-purulent fluid of a peculiar earthy fetid odour. In a few weeks he was able to go to business, but was never again robust. The expectoration continued purulent and fetid. Exacerbations of the local chest-symptoms occurred from time to time, and were generally attended with slight hæmoptysis.

In this way he went on until March, 1856, when he had a sudden seizure, lasting for nearly two hours. The symptoms were vertigo, faintness, and loss of power on the right side; he was not unconscious. The day following, he was at his business, as usual, but ever after he would at times complain of *a tired feeling in the head*, and was easily fatigued. Singing at church, and other loud noises, distressed him. With these exceptions, however, he appeared in his usual health, and continued to perform active duties; and though I often saw him for the chest-affection, he never complained of anything in the head. November 15th, about two o'clock, he was surprised by a sudden and violent chronic convulsion of the right arm, lasting for several minutes. It was so severe as to oblige him to support himself by holding the table with the other hand. He felt quite well at the time, and when the muscular action subsided, went on with his duties as before. He left the warehouse at four o'clock, and was walking to the omnibus, when the right arm was similarly affected a second time, for a minute or two. He still felt quite well, and took his place in the omnibus, but had not proceeded far, before the movements returned a third time, now affecting slightly the muscles of the face and of the leg, on the same side. After lasting as before, but a few minutes, they again left him. When I saw him at six oclock, he appeared quite well. The voluntary movements were every where perfect, vision and pupils natural; no headache, nor trace of mental disturbance, and with the exception of slight and transient vertigo at the time of the third return of the movements, there had been no symptom referable to the brain. He assured me he felt quite himself, and on my requesting him to walk round the room and examine the pictures and engravings on the walls, he asserted that he saw them quite naturally. He continued well until noon of the following day (November 16th), when the convulsions returned a fourth time, beginning in the same way with clonic spasms of the arm and face, on the right side, without loss of consciousness, but quickly assuming the character of a severe epileptic seizure, with insensibility.

After two hours he recovered, and the next day (the 17th) wrote to his sister, and complained only of weakness. On the 18th, he had another convulsion, with insensibility, followed by partial paralysis of the right arm and leg. On the 20th, he slept nearly the whole day; when awake he was quite himself, except the inability to move the right arm and leg freely. Up to this time he had no headache, and no delirium. On the 21st and 22d, he continued in the same state; pulse 80; skin cool; no heat of head; perfect clearness of intellect when fully awake; slight headache towards evening; constipation. On the 24th, the arm and leg were more numb and powerless; about noon, the whole side was convulsed, and he became insensible. The convulsions continued, with only short intervals of quiet, until 4 p. m. After consciousness returned, he remained speechless for many hours. On the 25th and 26th, he was much troubled by the almost constant recurrence of the clonic convulsion of the right side, including the face, but without insensibility. After the application of leeches, a blister, and free evacuation from the bowels, he was much relieved, and slept tranquilly. On the 27th, he complained of a "dead pain" in the head; there was still no febrile heat; he raised the right arm with more power; pulse 80. On the 29th, the arm and leg were quite paralysed; the muscles flaccid; sensation not much diminished. By this time he had greatly emaciated: when asked if he had pain in the head, he replied slowly—"I ought hardly to say pain," and afterwards added, with a smile, that he was comfortable. The administration of an enema brought on convulsion without insensibility. On December 3d, there was great cerebral depression; he used words incoherently, asking for one thing, when he meant another. There had been no convulsive movements for two days, but now and then he seemed to faint for a time; the left hand was constantly pressed to the left side of the head; the right arm and leg were perfectly paralysed, and the muscles of the face on the same side partially so: pulse 80; tongue protruded straight. On the 4th, he uttered a few sentences very slowly and interruptedly, but lay for the most part in a half comatose state; took food readily. During the 4th, 5th, and 6th, he lay perfectly quiet, occasionally breathing with a little stertor, but generally so calmly that it was difficult to say whether he breathed or not; could be roused, and understood what was said to him; expressed by signs his desire to have food, and the like. On the 7th, the urine passed from him involuntarily, though he retained his consciousness, and once smiled faintly when his sister was near him. From his movements, it was evident he suffered a good deal of pain in the head. He could not understand questions, but recognised signs; pulse 56; respiration 20; pupils equal, rather less contracted than in sleep; abdomen collapsed; several rigors, followed by spasmodic extension of the whole body. On the 8th, was unable to swallow: towards evening, very severe convulsions came on, and lasted several hours, when he died exhausted.

Post-mortem examination.—The integuments of the head and calvaria healthy. In the posterior lobe of the left hemisphere of the brain, on a level with the corpus callosum, there was an encysted abscess, containing two ounces of mucoid, greenish, fetid pus. The cyst was bounded externally by a thin layer of greenish brain-substance; the membranes over it were not inflamed. The wall of the cyst was about one tenth

of an inch thick, it was vascular. The brain-tissue around was softened from inflammatory œdema. Slight increase of fluid in the lateral ventricles. No disease of the temporal or of the other bones at the base of the cranium. Firm pleuritic adhesions over the lower lobe of the right lung, and an irregular cavity, as large as a pullet's egg, in the pulmonary tissue. The lining membrane of this cavity was smooth and transparent, and on the proximal side perforated by several bronchial tubes. The tissue around was indurated. No trace of tubercle in any of the tissues. Abdominal viscera healthy.

Remarks.—The sudden seizure in March, though so transient that it caused no alarm, was probably indicative of the commencement of the suppurative process in the brain, which afterward pursued, during eight months, an entirely latent course.

The order of the symptoms in the final attack, was characteristic of the onset and extension of the inflammation around the old cyst of the abscess. Clonic spasm of the right arm as an isolated symptom, without any other disturbance of the nervous system, was the opening phenomenon. The day following, the convulsions became epileptic. On the fourth day, after a repetition of such convulsions, the right side was left partially paralysed. The hemiplegia then gradually became complete, and the patient became drowsy and indifferent, and at length comatose. These symptoms, associated with the chronic disease in the lower lobe of the right lung, were the basis of a correct diagnosis.

CASE XIV.—*Encysted abscess in posterior lobe of left cerebral hemisphere; heart drawn over to right side of chest; pleuritic adhesions; external fistulous opening, and dilated bronchial tubes on the same side.*

J. H—, æt. 23, a policeman, who had been in Guy's Hospital a year before for pleurisy, was again admitted March 23d, 1853. His symptoms were considered obscure. It was suspected that he might be labouring under chronic hydrocephalus. There was mental confusion and loss of memory. No paralysis. He was sensible until his death which took place unexpectedly, April 28th. The account he gave of his illness was, that, six weeks before admission whilst on duty, he had a sudden seizure with partial loss of consciousness, and the same day a second seizure. After a month he had a third seizure. From the time of the first attack he had headache and vomiting.

Post-mortem examination.—No disease of the cranial bones. Membranes of the brain healthy. A large abscess in the substance of the white matter of the posterior lobe of the left hemisphere, not implicating the thalamus opticus. The walls of the abscess were remarkably thick and in many parts mottled with tortuous capillary veins. The whole cyst was easily enucleated from the surrounding cerebral substance which was softened and of an opaque white. The walls of the cyst could be divided into three layers; the external layer was finely fibrous and rather loose, and composed of a cellular web, the remains of softened nervous tissue; the middle layer was dense and translucent, it was formed of fine, rather flattened fusiform fibres with elongated nuclei; the inner layer or so-called pyogenic membrane was opaque and brittle, it consisted of an adherent layer of nuclei and exudation-cells, many of which were undergoing granular degeneration. The pus amounted to about two ounces. It was clotted and mucoid and decidedly alkaline. It contained opaque granules and fibrinous sheds undergoing earthy infiltration. The abscess had burst into the descending cornu of the lateral ventricle. The surface of the corpus striatum and thalamus on the side of the rupture was of a dull colour, but without inflammatory exudation. Right lung universally adherent. The lower portion of the pleura thickened, and in it a fistulous canal opening externally but not communicating internally with the lung. Pulmonary tissue compressed, the tubes dilated. Heart drawn over to the right side by adhesions of the pericardium to the lung. Left lung partially adherent.

Remarks.—There cannot in the nature of the case be any symptoms pathognomonic of abscess of the brain. It is often only from the collateral circumstances, that we can rightly estimate the nature of the cerebral disorder. In this case the sudden seizure with partial loss of consciousness if not epileptic should have caused a suspicion of some local disease in the brain. The same symptom has often been noticed in cases of tumour as well as of abscess. The differential diagnosis would rest upon the absence of pain preceding and following the seizure; the rapid progress of the symptoms marked by weeks rather than by months; the character of the cerebral oppression and the local conditions of the chest. The

frequent absence of rigors in cerebral suppuration has been already noticed. Although the contents of the abscess were undergoing the earthy change there was a gradual extension towards the lateral ventricles.

CASE XV.—*Inflammatory cysts with surrounding solid exudation in anterior part of right hemisphere of brain probably excited by* contre-coup.

William S—, æt. 40, a tall, athletic man, of rather free habits, though not a drunkard, by occupation a mill-wright, began to suffer with severe headache in the spring of 1854. The pain was principally across the forehead and at times so severe that, to use his own expression, he thought he should go out of his mind. He continued at his work until the end of November, when his memory became impaired; he had transient attacks of unconsciousness, and at other times lost his sight for half an hour or so. He had frequently double vision, and was troubled by dark, irregular forms creeping before him. From this time he had vomiting and constipation, and began to emaciate. January 5th, 1855, he was admitted into Guy's Hospital, under the care of Dr. Barlow. His manner was dull, he complained of constant pain in the head, aggravated in paroxysms. There was no paralysis, but his movements were sluggish, and he could not stand long without feeling faint. Vision impaired. Pupils dilated. Urine scanty, depositing phosphates largely when heated. His wife gave an account of a severe fall which he had about Christmas, 1853, by slipping upon the pavement and striking the back of his head. He was stunned at the time, but the effect soon passed off and the accident was forgotten. He remained in the hospital until the 24th of February. On several occasions he had seizures in which he lost all muscular power; these he called faintings. At the beginning of April he was re-admitted into the hospital. He was then totally blind. He could neither walk nor stand, but could move his limbs though he did so tardily especially on the left side, and remarked that "they did not feel the right thing." The left seventh nerve was partially paralysed. Tongue projected straight, covered with a thick creamy fur. Left to himself he lay continually as if asleep. When aroused he answered questions slowly, in a loud monotonous voice, interrupted by an occasional yawn, or dozed off in the middle of a sentence. "Has an awful headache and that's all his complaint." Pupils widely dilated and unaffected by light. Urine and fæces the last few weeks passed involuntarily. Occasional returns of the fainting seizures. He took readily whatever food was put into his mouth, but was too dull to feed himself. Deglutition perfect. Pulse 64. Respiration 16, tranquil. He lay in a semi-comatose state until his death on the 26th. The right pupil was large and fixed, the left smaller and unaffected by light, but spontaneously dilated and contracted. There were no convulsions. A few days previous to death several bullæ formed on the legs and ankles, and he became slightly jaundiced.

Post-mortem examination.—The wasted body of a strong man. Integuments of a faint yellow colour. A few large blebs on legs and feet. Head very large and round measuring

thirty-three inches in circumference. Calvaria very thick, dense, and heavy. The whole inner surface was vascular and roughened by ossific granulations. The outer surface of the dura mater was roughened in correspondence with the bone. Arachnoid slightly opaque. The anterior lobe of right hemisphere swollen and pressing over on the left. The convolutions flattened. Immediately below the surface a cyst the size of an egg, and to its inner side a smaller one. They contained a clear, yellow, mucoid fluid, with opaque particles floating in it. These consisted of fatty granules, loosely collected together, or contained in large regular cells. The larger cyst was round and circumscribed except on the inner side, where it was connected with the smaller one; this was not so well defined. The lining of the larger cyst was smooth, with numerous small veins ramifying in it. The walls consisted of yellow solid exudation, part fibrillated, and part granular, containing exudation-cells and oil-globules scattered or grouped together. The walls of the smaller cyst were flocculent, but presented the same microscopic indications of inflammatory deposit undergoing fatty degeneration. The brain-tissue around was yellow and soft with vascular striæ. The cysts pressed on the right crus cerebri, on the second, third, and fourth nerves of the same side, and on the opposite hemisphere. The inflammatory softening extended to the middle lobe and to the outer side of the corpus striatum. The thoracic and abdominal viscera healthy, with the exception of recent hæmorrhagic infarction of the spleen and of the mucous membrane of lesser curvature of stomach.

Remarks.—This case is given as a connecting link between tumour and abscess. The symptoms and chronic course of the case were such as occur in tumour; obstinate headache continuing for months, followed by double vision and partial amaurosis, then vomiting, constipation, and cerebral oppression. The mechanical action of the cysts on the surrounding structures would obviously be nearly as in tumour. The difference of the structure of such cysts and of their contents from those of abscess, is probably one only of degree depending upon the activity of the morbid changes. The operation of *contre-coup* was favored by the height of the man's stature, and the size of his cranium; circumstances, apparently trifling in them-

selves, but not to be overlooked in estimating the effects of such a fall as he had.

CASE XVI.—*Chronic disease of mucous membrane of nose; partial absorption of horizontal plates of æthmoid; inflammation of under surface of anterior lobe of brain on right side.*

Thomas W—, æt. 42, employed at the tap of a public house, and of very intemperate habits. For an uncertain period he had been troubled with mucous discharges from the nose, and with vertigo and headache for five weeks. Ten days before admission into Guy's Hospital, March 29th, 1855, he went to bed in his usual health, and the next morning was found in bed insensible. He remained in this state, recovering, apparently, only the slightest glimmering of consciousness, and, at the best, not able to recognise his nearest friends. When first visited, he lay supine, and apparently insensible. The eyes were open, and directed slightly to the right side. When addressed in the loudest voice, no impression was made upon him. Both pupils were dilated, the right the larger, and slightly active. Left arm and leg motionless. With the right hand he so incessantly rubbed the chest and groins that it was necessary to muffle it to prevent further abrasion of the skin, which he had thus already produced. Respiration 16, stertorous, and with puffing out of the cheeks. Pulse 112. There was no alteration of symptoms. Towards the end, the breathing became quick, short, and entirely thoracic. He died April 1st.

Post-mortem examination.—The head only was examined. With the exception of a few slight opacities on the arachnoid, the membranes on the upper surface of the brain were healthy. The arteries and veins were full of dark blood. The lateral ventricles were dilated, and contained about an ounce of clear fluid. Their surface (ependyma) granular. Fornix and septum lucidum firm. On the under surface of the anterior lobe of the cerebrum, on the right side, from the olfactory bulb backwards to the fissure of Sylvius, the membranes were adherent, and thickened, and the convolutions softened. The olfactory bulb itself was slightly enlarged, and converted into a firm yellowish mass. The grey matter of the convolutions was eroded; the white substance of a yellowish gray colour. The softening skirted the edge of the longitudinal fissure backwards to the fissure of Sylvius, so as to affect the under surface of the corpus striatum. The horizontal plate of the ethmoid was very thin, but not carious. The mucous membrane lining the nasal cavities hyperæmic, and on the right superior turbinated bone, it presented an uneven granular surface, but no ulceration.

Remarks.—This case is introduced as an appendix to Case IV, to illustrate the extension of disease from the mucous membrane of the nose to the membranes and substance of the brain without caries of the bone. There was no ulceration of the mucous membrane. We may thence conclude that the changes in the capillaries through which the morbid action is distributed, may be independent of any destructive action in the tissues. In gonorrhœa, the capillaries and their contents propagate the morbid action without ulceration. General phlebitis may occur from simple sprain of a joint without any lesion of the skin or tearing of deeper parts.

PARAPLEGIA

FROM

OBSTRUCTION OF THE ABDOMINAL AORTA.

By WILLIAM GULL, M.D.

J. B—, æt. 34, employed as a shipwright in the dockyard at Woolwich. Habits temperate. Accustomed to take part in carrying heavy loads; and being over six feet in height, the greatest share of the weight often falls to him. At the beginning of March, 1855, being then, as he supposed, in good health, he was suddenly seized, whilst at work in a stooping posture, with pain round the loins. This went off after he had rested a few minutes. With the pain he had a desire to go to stool, but without effect. As he resumed his work, the pain returned, and extended down the legs, with a sense of numbness, soon followed by entire paralysis both of sensation and motion, from the loins downwards. The sphincters were paralysed. After a few days, sensation returned, and he was able to take a few steps unsupported. He gradually improved, but the gait remained unsteady, and the use of the legs soon brought on increased weakness and numbness. For these paraplegic symptoms he was admitted under my care into Guy's Hospital, in June of the same year. On examining the spine, no tenderness nor irregularity could be detected, but on auscultation, a soft, bellows-murmur was audible down the back, but most distinctly at the lower angle of the scapula, on the left side. There was no pain or tenderness at the part, nor any pain in the course of the intercostal nerves. Percussion elicited slight dulness where the murmur was most audible. Anteriorly, under the ensiform cartilage and lower third of

the sternum, there was a prolonged bellows' murmur, not heard so distinctly upwards in the course of the aorta, or towards the left axilla. There was no pulsation in the abdominal aorta, nor in the arteries of the lower extremities. The legs were cold, the muscles wasted; no œdema nor any venous turgescence in them. The superior epigastric artery, on the right side, was enlarged, and could be indistinctly seen pulsating for two inches of its length, the blood running from above downwards. From that date until the present time (August, 1857) the case has remained under notice. The superficial arteries of the back and abdomen have gradually enlarged. A few of the principal branches seen by the artist, as the patient sat before him, are shown in the sketches (Plate viii, fig. 1 and 2). These give, however, but a feeble idea of the extent of the arterial anastomosis as it can be traced by the finger under the integuments. At the posterior boundary of the axilla, on either side, the small arteries are so numerous as to form a soft pulsating mass, reminding one of the rich arterial plexuses in the intercostal spaces of the cetacea. The enlarged arteries on the back emerge at the fourth and fifth intercostal spaces, and dip again at the ninth. The anastomosis is much more extensive on the back and sides of the trunk than on the abdominal walls. From time to time he has slight returns of weakness and numbness in the legs. No pulsation is yet discoverable in the aorta or femoral arteries, nor in any of their branches. The systolic murmur at the lower third of the sternum remains. The chief part of the murmur now heard in the back, is apparently referable to the rush of blood along the numerous subcutaneous channels of anastomosis. The patient has regained power to walk tolerably well, but his muscles are thin and his gait languid. Feet cold and damp. His general health is good, and he is able to do the lighter parts of his work. The pulsation of the arteries of the upper extremities is full and throbbing, and the heart's impulse increased. There is no sign of venous obstruction.

Remarks.—When this patient first came under notice before his admission into the Hospital, it was thought that his symptoms arose from disease of the cord. On his admission, when

the loud systolic murmur in the lower sternal region was discovered, and traced round to a corresponding point at the back, it was then thought that the paraplegic symptoms arose from an aneurism making its way back upon the spine. Against this supposition, however, there was the absence of pain at the part. The patient had also been slowly improving after the first acute onset of the symptoms, which was not to be expected if an aneurism were eroding the bodies of the vertebræ, and pressing on the cord. The further examination of the case, disclosing obstruction of the abdominal aorta, made it probable that the paraplegia had arisen from some sudden deficiency of arterial supply to the lower extremities, as in the experiment by Sir Astley Cooper of ligature of the abdominal aorta in a dog. With this view, there was a hope that, by time and rest, the collateral circulation would meet the difficulty, and the symptoms diminish in proportion. The truth of these inferences has been confirmed by the progress of the case. The development of the arterial anastomosis has been watched from month to month, and as it has become more distinct, the patient has regained more power. He has now probably reached the climax of improvement, and though able to walk, and do light work, he is not robust. There is no trace or symptom of any absorption of the vertebræ, nor any sign of pressure on the vena cava inferior. What the nature of the obstructing cause in the aorta may be is conjecture. Whether a slow process of narrowing, and at length a sudden obstruction, or whether some displacement of a fibrinous clot in an aneurism at the part, or some limited source of constriction or pressure cannot be made out. The condition, whatever it may be, obviously dates from the occurrence of the paraplegia, as proved by the development of the arterial anastomosis since that time. Although incomplete, the case is, I think, so remarkable as to justify its being, at this stage, put on record. It may fall to some other hand to complete it.

Plate VIII.

Figs. 1 and 2, show some of the subcutaneous arteries on the abdomen and back, in the annexed case of paraplegia from obstructed aorta.

Plate VIII.

Fig 1.

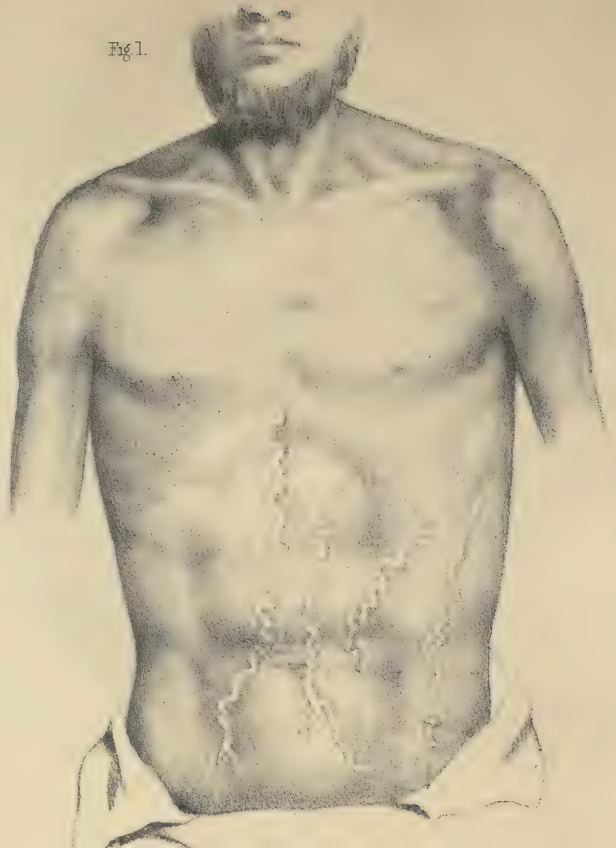
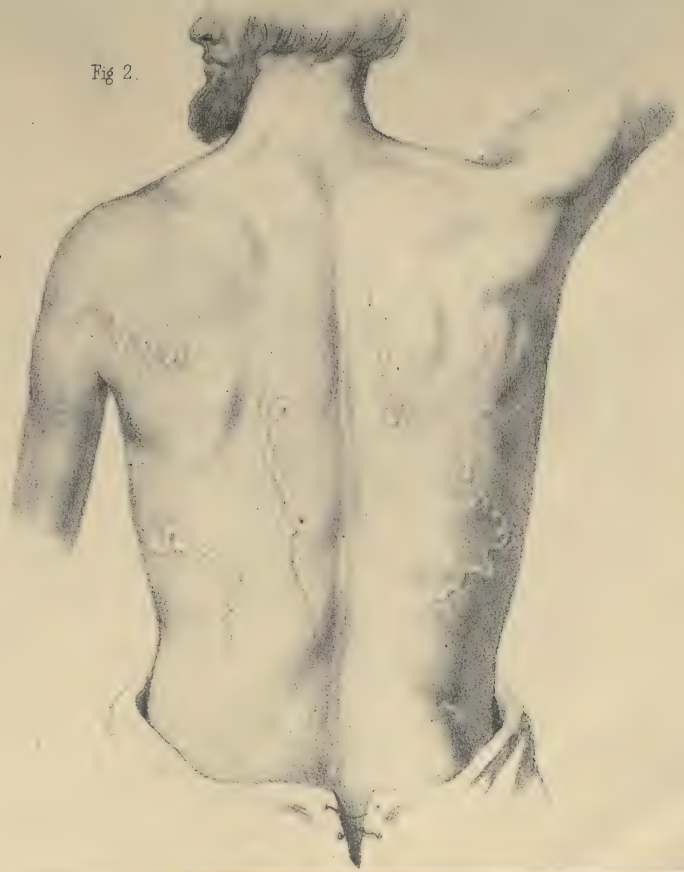


Fig 2.



CONTRIBUTIONS TO THE PRACTICAL SURGERY

OF

NEW GROWTHS OR TUMOURS.

SERIES I.—CANCER.

By JOHN BIRKETT.

It is proposed in this and the subsequent series of cases to illustrate, for students more especially, the natural history of every form of new growth, which has come under observation within the walls of Guy's Hospital. An immense accumulation of cases is on hand, from which a selection must be made, and in the museum there are the preparations of a very large number, to which may be added the models and delineations of all their most remarkable appearances. I hope, therefore, to make this paper interesting and instructive to the student, by relating the history of those cases principally which are thus illustrated; for, at lecture, time will not allow of the full detail of the clinical history of many cases. To the practical surgeon it may be useful should he desire to refer to cases bearing on one he may have under immediate observation and treatment. And, to the pathologist, I may say, that as the history and details of all the cases have been taken by myself, I can safely answer for those facts which have fallen under my observation. The costliness of illustrating this paper by coloured drawings renders such an advantage impracticable; and therefore to each case there is appended a reference to the preparation, model, or drawing, which being in the museum, are open to the examination of any gentlemen interested in their inspection.

Writers have given various names to cancer, according to its physical characters; its condition, stage, or progress; its relation to neighbouring tissues or organs; and its resemblance to certain well-known bodies.

Thus, its physical characteristics:—

1. Consistence, hard or soft, schirrous or fibrous, and medullary or fungoid.

2. Its colour; melanic, zanthoid, hæmatoid.

3. Its condition; occult or open, fungating, hæmatodes.

4. Its relation to surrounding tissues; infiltrating when it pervades an organ; tuberous, when circumscribed masses are developed and are impacted between organs and their parts.

5. From resemblance to well-known bodies; as Solanoid, like a potato; cerebriform, brain-like, gelatiniform, colloid, and such like.

6. Lastly, from containing elements identical with those of recognised tissues, as, cartilaginous or chondroid; osteoid, melanosis or melanic, from containing brown pigment like the choroid tunic of the eyeball.

The terms infiltrating and tuberous, are generally applicable for most practical purposes. These forms are met with independent of each other and conjoined. That is, after the disease has been developed in the first form, the second may grow around it, or as an outgrowth or offset from the primary tumour. The tuberous, as far as I have seen, does not pursue this course, for if the primary development be tuberous the subsequent growths are of the same character.

In this series I shall illustrate those forms of cancer which are most commonly met with in practice, and which may be described under the terms "infiltrating" and "tuberous." These are developed in and among the various organs of the body, and I shall demonstrate how the muscles and their appendages, the bones, and the different kinds of glands, secreting and lymphatic, become the seat of the primary growths of cancer.

From these cases I shall proceed to those varieties of cancer characterised by the presence of an additional material which produces the characteristic peculiarity, and describe examples of melanosis, melanoid, and osteoid cancer. I rather hesitate in adopting the term osteoid *cancer*, because,

as will be described, the elements so constantly met with in cancer did not exist in the case to be related, nor was there the slightest implication of the glands of the lymphatic system. The only resemblance to cancer consists in the general diffusion throughout the lungs of a disease identical with portions of the primary growth. I feel more disposed to consider this disease as one of recurrent or diffused fibroid tumour, in which the process of ossification occurred.

The cases are arranged in the following order: cancer primary.

1. Among the muscles; tuberous. Case I, II.
2. On tendon or its sheath; tuberous. Case III.
3. Around a flat bone; infiltrating and tuberous. Case IV.
4. In the shaft of a long bone; tuberous. Case V.
5. In a racemose gland, parotid; infiltrating. Cases VI, VII.
6. In lymphatic glands, cervical; infiltrating and tuberous. Cases VIII, IX.
7. In skin; melanosis. Cases X, XI.
8. In skin; melanoid. Cases XII, XIII.
9. In or around bone; osteoid. Case XIV.

CASE I.—*Medullary or tuberous cancer among the muscles of the posterior femoral region; secondary disease in chest; death; necropsy.* (Cast in Museum, 182[5]).

J. R—, a man, æt. 36, of robust, strong, and muscular frame, came under my notice in December, 1847. He was then under the care of the late Mr. John Morgan. In the spring of 1846 he observed, for the first time, a swelling in the internal and posterior region of the right thigh. It was soft, moveable, and elastic, and caused only a general fulness of the region, for he experienced no pain. At this time the new growth was clearly made out to be developed among the posterior femoral muscles. I watched this case, and attended the man at home. As the disease increased, the sufferings of the patient became very severe; the skin became infiltrated, it ulcerated, and a sprouting growth was developed, which bled freely. The powers of the patient slowly became ex-

hausted, and some weeks before his death, the indications of thoracic, visceral, secondary growths were very clear. He survived the discovery of the primary growth about two years. I made a cast of the posterior and internal femoral region, which is in the museum.

Sect. cadav.—The body was wasted, but still a considerable layer of adipose tissue existed. The circumference of the right thigh measured twenty inches. The new growth occupied nearly the entire vertical length of this region. It was very soft, almost cream-like in parts. The finger passed freely between the femur and the tumour; the former being perfectly healthy. A large mass of a similar disease occupied the right inguinal region. In the parietes of the abdomen there was a small growth, but the abdominal viscera were free from disease.

Both the lungs contained tubera of cancer some two or three inches in diameter. They were chiefly just beneath the pleura. A large mass of soft cancer occupied the posterior mediastinum, and encroached upon the left pleural cavity. The bronchial tubes were obstructed with thick, tenacious mucus.

This case is an excellent example of a class of cases unfortunately too common, and affords the student an opportunity of pursuing the various stages of this disease.

The primary tumour is the first object of attention, and its diagnostication is important. It should be noticed that the growth was, at first, unaccompanied with pain; for, I believe, it will be found that when cancer is developed primarily in bone, intense pain, or at least, considerable pain is the first symptom complained of. But, when among the muscles, pain is not experienced until, by the size the growth reaches, it presses upon the trunk of a neighbouring nerve, in which case the pain often shoots along the course of the subdivisions of the nerve. Also, when bound down by dense fascia, the pain is intense until the fascia gives way, after which the disease generally grows rapidly. The nature of the growth was believed to be cancer, and as an attempt to remove it would have been somewhat hazardous, the operation was never proposed.

CASE II.—*Carcimona in thigh subsequent to injury. Death.*

A young woman, æt. 30, was admitted into Guy's, in December, 1836, on account of a large tumour in the posterior region of the left thigh. She was delicate looking, but her constitutional nutrition was good. Six months before admission she had observed a swelling in the part, and she remembered that, eighteen months preceding that, she had violently contused the back of her thigh. It was quite clear that there was a large growth among the muscles of the thigh. It was moveable, not attached to the femur, but beneath the fascia. The pain had not been very severe until lately. Mr. Morgan, under whose care she was admitted, proposed to excise the tumour, and, in completing the second incision, he exposed nearly the whole length of the great sciatic nerve, which was stretched over the growth. This was then separated from the tumour, and held upon one side, in an isolated state, in order to complete the operation. A large mass of medullary cancer was removed from between the muscles. Soon after the patient returned to bed she began to vomit, she had a restless night, the next day she passed into a state of collapse, and died in about fifty-eight hours after the operation. The general impression at the time being, that the disturbance to which the sciatic had been subjected, and which was unavoidable, was the cause of the great constitutional depression.

CASE III.—*Primary tubercle of cancer on the middle finger; removal. Secondary growth in the cicatrix; removal of finger. Another growth in hand; amputation through the forearm. Growth on the head. Death from jaundice. Necropsy.* (Drawing 29^{22}; prep. 1636^{30}.)

J. M—, a man, æt. 43, but whose aspect betokened more advanced age, came under my treatment in April, 1855. He had been a publican twelve years, a general dealer, and had had much mental anxiety. He was very excitable; nervous; of dark, strumous aspect; fat and relaxed tissues. About ten years before, he accidentally discovered a lump on the palmar surface of the left middle finger. It slowly increased, was

hard as a nut, moveable, and it became red after some time. After four years' growth, when it was about two inches in diameter, and very painful, it was removed with the knife. The wound healed in about a month, soon became painful and swollen, and then, in July, 1850, the finger was removed from the head of the metacarpal bone. The disease did not re-appear for three years, but about two years since, the hand swelled, especially around the metacarpal bone of the middle finger. Ulceration of the palmar integument supervened twelve months since; and when admitted into the hospital the hand was greatly deformed by the development of a new growth, which projected in bold relief upon both its palmar and dorsal surfaces, stretched the index and ring fingers widely from each other, and rendered the member perfectly useless. The lymphatic system was quite free from disease.

Mr. John Griffith, of Hereford, kindly favoured me with the following notes of the case:

"J. M— had a soft, indolent, irregular tumour within the theca of the flexor tendons, extending from the first to the third joint of the left middle finger. The integuments had a normal appearance. This was excised September 4th, 1848. The disease reappeared, and on July 20th, 1850, I removed the finger. Two years ago, the divided end of the flexor sublimis tendon was found enlarged to the size of a bullet, and very hard. As the muscle contracted, the tumour rose higher in the palm. In a few months the integuments became thickened, elevated, and had in the centre a minute cluster of vessels of a crimson hue."

On May 15th, 1855, I amputated the hand and inferior fourth of the forearm.

A horizontal section of the growth was made, which demonstrated most satisfactorily its relation to the surrounding parts. The disease had been evidently once confined to the tendons and theca of the middle finger, but spreading from these structures, it finally involved the collateral members of the hand. The section exhibited a somewhat uncommon variety of carcinoma, for there appeared to be circumscribed masses of disease, with most distinct envelopes, here and there,

partaking, very much, the aspect of a variety of cystiform growth. The nerves, vessels and tendons of the hand were pushed in various directions, as the growth enlarged, and there was no evidence of infiltrating cancer.

An examination of the elementary tissues of the growth showed that it was cancer. The stump progressed favorably until slight sloughing occurred, then secondary hæmorrhage, and, at last, a portion of the end of the ulna exfoliated. After being in the hospital a few weeks, he called my attention to a small growth on the scalp at the vertex of the head. This resembled very closely the hard follicular growth of this region. It had been growing sixteen or eighteen months, and measured about one inch in diameter. I removed it on July 30th, 1855. Its structure was identical with the disease in the hand, and, like that, was developed in relation with tendinous tissue. This wound was healing when he left the hospital, at which time the stump had healed. He returned home in August, 1855, and in the following month he wrote that he was "suffering from the liver complaint," that he was jaundiced, that another portion of bone was exfoliating from the stump, and that the wound on the head was not quite healed. He varied little from this condition, and died in March, 1856.

Mr. Lingen, of Hereford, kindly sent me this report of the necropsy: "We were surprised at not finding encephaloid disease in connection with those spots that were so ugly on the surface of the head. There were some slight adhesions of the dura mater thereabouts, else all appeared well here. The liver was generally rather "nutmeg" than encephaloid or cancerous, and the pancreas seemed scirrhous. The gall-bladder was full of calculi. He was generally reduced in flesh. You are aware that he was jaundiced for many weeks before his death."

The chief features of this very interesting case are as follows:

The man was thirty-three years old when the primary disease was developed.

This grew three years before it was removed.

The disease reappeared in six months.

The age of the second growth was one year and six months when it was removed.

The disease did not appear in the hand until the lapse of three years after the removal of the finger.

The age of the third growth was about two years when I performed amputation; and, lastly,

The patient survived the development of the primary growth about ten years.

From this statement, it appears that the second growth increased more rapidly than the first, and the third more rapidly than the second, a circumstance which is observed commonly.

But the interval of time between the development of the second and third growths was considerably more than that between the first and second, which is not usually the case when the disease recurs around the cicatrix. Probably this might be owing to the member having been amputated at the metacarpo-phalangeal joint. A remarkable feature of this case is the total freedom of the lymphatic system from all appearance of disease.

Practically, it shows the advantage of amputating the member affected at, or beyond, the joint next above it, for after amputation of the finger the disease did not reappear for three years after.

Case iv.—*Cancer about scapula; rapid development after contusion; extensively diffused secondary growths of cancer; death; necropsy.* (Prep. 1098[10].)

A girl, æt. 22, who had been but a few months in London, came under my care in Guy's in October, 1855. Formerly in the occupation of a domestic servant, she had been of late addicted to irregular and depraved habits. Her previous health had been good, and her aspect, although worn and anxious, did not indicate a morbid state of nutrition. The girl stated that for six or seven months she had been troubled with "rheumatic pains" in the left shoulder, and was compelled to resign all work on this account. The pain was intermittent at first, but five weeks since it returned with even greater severity. This was after a contusion of the part

by falling upon the pavement, seven weeks since. About fourteen days after the fall the left shoulder began to swell close behind the acromion. She described the pains as excruciating, gnawing, aching, extending to the elbow, along the arm, and into the axilla. When she first came under observation there was great fulness in the posterior scapular, infra-acromial, and axillary regions, and in front of the clavicle. By pressure a sensation resembling the fluctuation of fluid was felt, particularly like fluid confined beneath fascia. I made a puncture into the growth to the depth of the scapula, but blood only escaped. The entire mass and scapula moved together. The movements of the shoulder-joint gave no pain, but were limited in consequence of the patient being unable to employ the deltoid muscle.

During the three weeks she was in the hospital the disease advanced rapidly, her sufferings were excruciating, and my attention was drawn to a swelling by the side of the sternum, at its junction with the fifth costal cartilage. Suddenly, one morning, she began to vomit, after having felt more than usually ill the day before; she quickly passed into a state of collapse, and died within twenty-four hours from the commencement of the attack. Dr. Wilks made the following notes of the post-mortem examination:

Upon removing the calvaria, a soft carcinomatous tumour was seen occupying the posterior part of the skull, in the situation of the left cerebral fossa of the occipital bone; the growth was about an inch in diameter, and whether it had its origin in the outer surface of the dura mater or in the bone, was difficult to say, though probably the former. It was developed between these structures, and the bone was destroyed to about half its thickness, that is, to the diploë, leaving the outer table intact.

Around this excavation the inner surface of the skull was very vascular, spongy, and covered with bony spiculæ. These stood up side by side, and produced a velvety appearance. The outer surface of the dura mater was involved in the cancer, but the smooth internal arachnoid surface was quite unaffected. The bulk of the tumour projected inwards, and caused a corresponding depression upon the posterior lobe of the brain. Except this depression the brain was healthy. At the junc-

ture of the fifth costal cartilage with the right side of the sternum was a tubercle of soft cancer, about half an inch in diameter. It had destroyed the cartilage, and projected slightly inwards and outwards. Some tubercles of soft cancer, were seen upon the surfaces of both lungs, beneath the pleura. Projecting from the head of the pancreas was a mass of cancer an inch in diameter, which had infiltrated that part of the organ. All the other viscera were free from disease.

A large mass of cancer, eight inches in diameter, involved the left shoulder. It was semifluid, and of a red colour, from effused blood. It was principally situated around the scapula, both above and beneath it. The scapular muscles were, consequently, quite detached from the bone, and the last organ was nearly destroyed. The bone, when removed, appeared quite dead and was so thin and porous that it was diaphanous. The brachial plexus was involved in the cancerous axillary lymphatic glands.

In this case we have a good illustration of the rapid progress made by a cancer after the fascia which bound it down has given way. Until after the contusion of the part, the disease had not been very visible, but by this injury the fibres of the scapular fascia were probably lacerated, and freedom thus given to the rapid expansion of the growth. The "rheumatic" pains described are also very characteristic, and should make an indelible impression on the memory of the student.

Case v.—*Cancer of femur and knee-joint; fracture of the bone; amputation through its upper third; abscess in pelvis; secondary growths in bones of skull; death; necropsy.* (Prep. 1162[45].)

A. H—, a married woman, æt. 30, was admitted under my care in May, 1855. She was born in Radnorshire, but had lived sixteen years in London as a domestic servant. Her aspect was cachectic, and her general nutrition defective. In December, 1853, she first felt pain, aching, and weakness in the inferior third of the left thigh, which was soon after accompanied by swelling and hardness. She became pregnant during the preceding October, and, therefore, this disease must have been developed very shortly

afterwards. When admitted, there was great enlargement of the lower half of the left thigh, and at first sight the disease seemed to involve the knee-joint. The movements, however, although restrained, were practicable, and it was at once clear that it was not the seat of disease. Several hard nodules were distinguishable from the general swelling, which yielded a somewhat elastic pulpy sensation on pressure. She stated that she first felt gnawing pains in the knee, and that, with intervals of about five or six weeks, the knee became for a short time intensely painful. After parturition, in July, 1854, the pain was scarcely endurable, and she had suffered much more severely and without remission since that date.

Three weeks before admission, she fell and strained the limb. Ever since her sufferings have been agonizing, and the growth has rapidly increased. An enlarged lymphatic gland could be felt in the groin, but there was no indication of internal or secondary growths. Whilst in the hospital, she felt something snap as she moved in bed, and next day I found that the femur was broken about the junction of the centre and inferior third. Her sufferings increasing after this event, I determined to amputate. On May 15th, I removed the limb, dividing the femur close to the trochanter minor. There was very little hæmorrhage. The patient being under chloroform, suffered little, and although very low, she progressed favorably for several weeks and with greatly diminished suffering. The disease removed exhibited a large mass of tuberous cancer, which had destroyed the shaft of the femur. Tubers of cancer pushed themselves into the knee-joint, and the head of the tibia had cancer developed in its cancelli; also tubers were developed within the neighbouring muscles. The elements of these growths were fibres and nucleated cells. The stump was very nearly healed when an abscess formed upon the sacrum, and, discharging profusely, exhausted the already diminished powers of the patient, who died three months after the operation. During this period she often expressed the very great relief amputation had afforded.

Dr. Wilks took the following notes of the necropsy: Body much wasted, bed-sore exposing sacrum, stump nearly healed. Scalp healthy, cranial bones much diseased on the right temporal region. They were thicker than usual and the bone heavy.

At the same time it was soft and could be easily broken down with the scalpel. Both the inside and outside of the calvaria had an irregular surface, from the spongy nature of the bone giving it many elevations and depressions. The former appeared like granular exudations of new bone, whilst the latter were covered with a membrane, and contained a serous fluid. These seemed to constitute the origin of the disease, for in parts of the more healthy bones were seen round white spots, which were cavities extending into the diploë, and filled with a semifluid substance, and covered with a transparent membrane. The principal disease occupied the antero-lateral portion of the skull, and enclosed all the right half of the frontal bone with the orbital plate, all the front and lower part of the parietal, the wing of the sphenoid, the squamous and anterior surface of the petrous portion of the temporal bone. These isolated spots of disease were principally situated about the anterior end of the sagittal suture. Under the microscope these softened parts were seen to be composed of fibrous tissue, with a number of free nuclei, and some nucleated cells, the latter small and not characteristic. The dura mater was healthy, except where it was roughened from being in contact with the diseased bone. The brain was healthy. An inch below the pylorus, in the mucous membrane of the duodenum was a round ulcer, two inches in diameter, with elevated edges, smooth surface, and apparently healing.

The peritoneum on the opposite side was thickened, and adherent by old, firm, fibrous tissue to the gall-duct. Small intestines healthy, with the exception of a healed ulcer in the upper part of the ileum, of the same nature as that just described in the duodenum. The liver contained much fat.

There was necrosis of the posterior surface of the sacrum and ilium, at that part upon which the patient had been lying so long a time. Suppuration existed in the cellular tissue of the pelvis, particularly of the left side.

Neither in the thoracic nor abdominal viscera, nor lymphatic system, were there any traces of secondary cancer, although these were soft and somewhat disorganized by long-continued illness.

The stump was nearly healed, except at one part, where there was a small collection of pus. The bone was quite

healthy and no trace of cancer existed in it or the soft structures around.

Considerable advantage was gained in this case by amputation, and the performance of this severe operation was fully justified by the result. Indeed, it is under circumstances of this nature that operative interference is called for. To endeavour to prolong life and assuage pain are the duties of the surgeon, even should he be compelled to resort to severe measures for that purpose. But to propose any treatment on the ground of accomplishing that which, if he have any knowledge of the progress of these cases, he must know he cannot effect, is to place himself on the lists with the charlatan and impostor.

Case vi.—*Carcinoma in parotid region developed in the site of a "lump" recognised forty years before; destruction of portio dura; ulceration; death.*

M. S—, æt. 55, a native of a country village, came under my observation in December, 1853. She had enjoyed good health, and was of an excitable temperament. About forty years before she observed a lump in the right parotid region, which did not cause any trouble or anxiety until about six months before admission into Guy's under my care. At this date, the entire right parotid region was occupied by a new-growth fixed to the neighbouring tissues, its surface red, giving a sense of fluctuation to the touch, and causing intense pain. For a week the right facial muscles had been paralysed. During the last six weeks the disease had grown rapidly. Her general health was declining. I punctured the growth, and determined by the examination of the material which escaped that the disease was cancer. About a week after this the skin ulcerated, and sloughing of a portion of the tumour occurred, but the facial paralysis was persistent. In this condition she returned home, and died about March, 1854.

One of the most interesting facts of this case is the long period of time during which the growth hath existed before assuming much activity. After being questioned over and

over again, she persisted in the statement that "there had been a lump growing there at least forty years." If this was the case, the disease must have been developed even before the twentieth year of her age. But I should rather assume that the "lump" was an enlarged gland, and that the subsequent growth was altogether independent of it.

The puncture and removal of a sufficient quantity of the elementary tissues of the growth was here practically useful in assisting in the diagnostication of its nature.

The fact of paralysis of the facial muscles consequent upon the destruction of the portio dura by the infiltrating growth, is also, I believe, of practical importance in reference to diagnosis. I have never yet met with a case in which any other form of tumour, in this region (and it is a region in which new-growths are often developed), has induced paralysis by its pressure alone. But in this case, as well as in the following, such a result ensued in consequence of the destruction of the nerve. The close adhesions of the growth to the neighbouring tissues rendered any operative interference inadmissible.

CASE VII.—*Cancer in parotid region developed about a "lump" of twenty-five years' growth; paralysis of portio dura; removal of the growth; return of the disease; death.*

J. D—, æt. 52, a farmer, from Radnorshire, came under my care in Guy's, in November, 1854. He had been a very healthy man, had lived an active and temperate life, enjoyed a healthy aspect, and calm, resigned temperament. For twenty-five years he had observed a "kernel" in the left parotid region, which has steadily increased. When he came under my observation, there was a growth occupying the left parotid region, firmly and deeply fixed to all the tissues around. The skin over it was slightly red. He complained of sharp, shooting, darting pains. His general heath was unaffected, but two or three lymphatic glands in the neighbourhood were enlarged. For nearly three months the left facial muscles had been paralysed.

On November 7th I removed the growth, which was deeply imbedded in the parotid. In fact, it was beneath this gland. The proximal end of the facial nerve was ragged, and as if

torn. The growth had not a well-defined envelope. It was very firm and dense in the centre or nucleus, and there was evidently a growth of more recent development around this centre. In some parts the latter growth was softening.

Very little hæmorrhage attended the operation, for, although the wound was deep, there was not a blood-vessel tied.

Convalescence was favorable, but the wound had not quite healed when he left the hospital. In a few weeks the cicatrix had an unhealthy aspect, cancer was again developed, and before the expiration of a year this man died.

The larger portion of the growth removed exhibited the elementary structure of cancer, but the central nucleus had more the characteristics of the fibro-plastic developments.

CASE VIII.—*Cancer in cervical region, about the tongue and larynx; death; necropsy; cancer in spleen, and generally diffused throughout the liver.* (Drawing 46^{54}, 345^{25}.)

E. F—, a male, æt. 49, came from Dorsetshire, into Guy's, under my care, in November, 1853. His general health had been good, but his aspect was worn and cachectic. He stated that he was quite well a year before, and that about that period he observed a small lump on the left side of his neck. Others subsequently appeared from time to time, but now a very large mass of new-growth extends from the cervical spinous process behind to the larynx in front, and from the lower jaw above to the clavicle below. This growth had increased rapidly the last four months. Several nodules, probably enlarged glands, existed in the right infra-maxillary region. The tonsils were also enlarged, and they nearly met in the centre of the isthmus faucium. The tumour on the left side was partly solid and partly fluid, or very soft solid. The cutaneous capillary vessels were varicose and dilated in some parts over the tumour. This man remained in the hospital nearly three months, but, in spite of the treatment adopted, he never improved, but slowly declined. Before death, he became greatly emaciated, and all the nutritive sustenance he took seemed unattended by any beneficial result. I thought that, from the locality of the growth, there might

be pressure upon, or obliteration of, the termination of the thoracic duct.

Necropsy.—The masses of new-growth on the left side of the neck were medullary cancer, and they extended in all directions around the glottis, epiglottis, and root of the tongue and larynx. Some existed in the folds of mucous membrane about these organs. (Drawing 46^{54}.)

The liver exhibited a remarkable, and, I believe, undescribed appearance. Instead of there being any circumscribed nodules of cancer, the entire organ was infiltrated with the new-growth, causing it to assume a somewhat pearly appearance, or as if some portion of the lobules were partially congested. The nucleated elements of cancer were clearly discernible under the microscope. (Drawing 345^{25}.)

The spleen was also the seat of cancer-tubercles; minute, white growths, circumscribed and sharply defined, in which cancer-cells were very distinct.

A careful examination of the state of the thoracic duct was made, but there was no proof that any abnormal pressure existed upon this important organ.

CASE IX.—*Cancer of cervical glands; infiltrating cancer of liver.* (Drawing 46^{55}.)

Emily G—, æt. 40, a widow, residing at Sutton, was admitted under Dr. Babington's care, May 18th, 1853. She was a woman of light complexion, and her countenance was expressive of great anxiety. The first symptoms came on six months before her death with swellings of the neck: with the increase of the glands of the neck, a tumour appeared in the abdomen. There was thirst, distressing sense of heat in the abdomen, emaciation, œdema of the legs, which were very painful, and her urine was albuminous. She sank at last exhausted. The tumours in the neck were thought, on admission, to be strumous.

There was carcinoma of bronchial glands, extending into the left lung. Heart healthy, with the exception of slight thickening of the mitral valve. There was malignant disease of the lumbar glands, which had pressed upon the vena cava, and the liver was infiltrated with malignant disease; and with

this there was considerable thickening of Glisson's capsule: there were also small tubercles in the kidney. The liver weighed 6½ lb., the spleen 3½ lb.

CASE X.—*Melanic cancer of sole of foot; development of the disease under the skin over the whole body; death; necropsy. Remarkable diffusion of the disease.* (Drawings 188[26, 27], and 463[5]; Model 293[5, 6]; Prep.—Heart 1400[25], Spermatic cord 2367[80], Omentum 2464[5].)

A man, æt. 60, was admitted under my care into Lazarus Ward, in November, 1853, having a small elevated ulcer on the sole of the left foot. He had been a weaver, resided at Bethnal Green, was of temperate habits, but never very strong. Subject to the depressing influences of hard work, scanty food, and bad air, he had a cachectic aspect, and anxious expression. About a year and a half before I saw him he accidentally observed a small hard lump in the skin of the sole of the left foot. In a few months the skin ulcerated, granulations sprouted, and oozing of ichor had continued since. The ulcer was about one inch diameter, and half an inch in relief. It had never been painful. His general health was now very indifferent, although the constitutional nutrition was not much deteriorated. About six months since, the left inguinal lymphatic glands enlarged, and the left leg became œdematous. In the skin of the body there were numerous minute tubercles. Whilst this patient was in the hospital, these tubercles enlarged, new ones were developed, and they all assumed more or less of a dark, blackish, or purple tint. At last a new-growth was felt in the hypogastric region of the abdomen, which was very moveable. The left inguinal glands enlarged, and the left leg became more and more œdematous. About a month before death, very distressing and uncontrollable vomiting ensued, and he sank rather from inanition than from any acute disease.

He was fifty-eight years old when the disease was developed, and he survived it one year and ten months, during which time an enormous amount of new-growth was formed, as revealed by the necropsy.

In the integuments of the entire body there were innume-

rable masses of melanic cancer, varying from a quarter of an inch to two inches in diameter. A large mass was developed in the omentum, and this formed the tumour felt in the abdomen during life. In the spermatic cord, on the surface of a kidney, in the pericardium, and between the cardiac auricles, there were masses of the disease.

The lumbar lymphatic glands, as well as the posterior mediastinal, were also infiltrated.

The lungs and liver were both of them perfectly free from any melanic cancer.

The universal distribution of melanosis is the remarkable feature of this case, and it offers a good type of this fatal disease. The primary growth was not nearly so characteristic of melanic cancer as those which were formed subsequently, for its appearance was that of any ordinary bleeding, ulcerated cancer. This may serve to illustrate the relationship which exists between ordinary cancer and the variety in which the black pigment occupies the cells composing cancer generally. There was no difficulty in the diagnostication of the disease in this individual; and the secondary infiltration of the lymphatic glands, and general distribution of the disease, precluded all surgical interference with the primary or any other growth.

Case xi.—Model 290 (Skin-disease) and 72 (Path. models).

In contrast with this case, I will relate that of a man who came to Guy's from Sheire, and was under the late Mr. B. B. Cooper. He was between fifty and sixty years old, and had observed a small black patch in the skin over the root of the right side of the nose. His health was declining, and upon examining the abdomen, we felt great hardness and fulness in the region of the liver, as well as beyond the normal limits of that organ. Suspecting that the liver was diseased, the primary growth was not removed, for it did not give any trouble. A few months after his return home he died of jaundice, and I made a post-mortem examination. The liver was very much enlarged in consequence of the development of masses of melanosis throughout its substance. There was no other organ in the body affected with the disease. Here, then,

the force of the disease seems to have been concentrated in the liver, which was filled with tubera of the blackest melanosis I have ever seen.

The ages of these patients were about equal, but their social condition differed widely. One came from a most unhealthy and crowded locality, the other had long resided in a most salubrious district. Both men being of the working class, may have lived in a nearly similar condition as regards their means for obtaining nutritious food. It is certainly very remarkable, that in the case in which general diffusion of the disease existed, the liver was exempt, whilst in the other, with only a single cutaneous tubercle, the liver should be so deeply involved. The last case should remind the student of the important index the cutaneous and visible tubercle may be to the state of parts within and hidden from view; and further, it demonstrates the imperative necessity of fully and carefully examining every patient before submitting them to the performance of any operation, even of a trivial character, as the removal of the primary tumour would, in this case, have been.

Case xii.—*Melanoid cancer in the skin of the forearm; removal of the growth; reappearance of the disease in the cicatrix; amputation through the humerus; development of the disease in the stump; death.* (Drawing 188[25].)

A rather delicate-looking girl, æt. 12, was admitted under the late Mr. Key, in October, 1843, with a tumour growing in the skin on the front of the right forearm. It had been noticed as a hard lump a few months before, but was now ulcerated, elevated above the surrounding parts, nodulated, and of a black, purple colour. It appeared like "melanosis" in hue, was soft, disposed to bleed, and was increasing rapidly.

Mr. Key removed this new-growth and a portion of the surrounding integument with the scalpel. It grew from the fascia of the forearm. The purple colour was due to infiltration of blood, for upon examination with the microscope, although the nucleated elementary cells were very well seen, they did not contain the black pigment, a circumstance characteristic of true melanic cancer.

In May, 1844, the disease reappeared about the cicatrix on the forearm, and the lymphatic gland above the internal condyle of the humerus was enlarged, and probably infiltrated. Mr. Key amputated through the humerus, and the girl left the hospital well, and the stump quite healed. She continued well for twelve months, when the stump swelled and cancer was developed in it. The constitutional powers of the patient rapidly declined, and she died in the spring of 1847.

For some months before her death the disease had reached very large dimensions, and hæmorrhages and suffering hastened dissolution. I have no record of a post-mortem examination.

The patient was between eleven and twelve years old when the disease was developed.

The primary disease was confined entirely to the integuments, and had been growing only a few months when it was removed.

The secondary growth was developed about the cicatrix, and the patient was free from any disease nearly two months.

Amputation was performed about a year after the development of the first growth, and the patient survived its development about four years.

This case is a good illustration of primary cancer of the integuments, originating probably in the fascia of the forearm, and assuming the appearances of melanic cancer. The colouring matter in this instance was derived from the colouring matter of the blood, and certainly was not due to the development of pigment-cells. In this patient the disease was confined to that extremity primarily the seat of disease, for, even after amputation, the soft tissues of the stump became the seat of cancer, which ultimately destroyed life. A few months of the life of the patient were certainly rendered, by the operation, less free from suffering than if the primary disease had been allowed to proceed without surgical interference.

CASE XIII.—*Melanic cancer in skin of back; destruction of the growth by escharotics; return in cicatrix; excision of growth; exhaustion; death; necropsy; no secondary developments.* (Prep. 1362[35].)

H. C—, a married and prolific female, æt. 34, came under my care in July, 1854. She had, upon the interscapular region of her back, a very large ulcerated and fungating cancer, with a very black colour. It bled frequently, and poured forth continually a thin ichor. She related that six or seven years since she accidentally observed a little black mole between the shoulder-blades, and that, after some time had elapsed, this bled, scabbed over, and bled again, and so on until about fourteen months before admission into Guy's, when ulceration took place and the wound fungated, and she applied to a surgeon, who removed the disease by excision. The wound healed favorably, but soon after a tubercle of cancer showed itself in the cicatrix. This rapidly extended, although by repeated applications of escharotics portions were destroyed. She suffered so much from the disease that I proposed to excise it, especially as there was no evidence of any secondary extension or internal visceral complication. The hæmorrhage and discharge from it would soon have exhausted her, and the operation seemed, from the locality of the growth, practicable without risk of any great loss of blood.

On July 18th the entire mass of the disease was removed, together with sufficient of the surrounding integuments to ensure a healthy wound. Profuse hæmorrhage attended the operation, whereby the patient was much exhausted, and on the sixth day after she expired. For four days there seemed to be every prospect of her recovery, but she was then seized with violent vomiting, and soon fell into a state of great prostration.

A post-mortem examination was carefully made, but no trace of carcinoma existed in any part of the body. The tissue of her visceral organs generally were soft, and indicated a very low condition of nutrition. The growth removed was carcinoma, and the black hue it exhibited was derived from the colouring matter of the blood, and did not depend upon the

development of brown pigment in the nucleated cells. It was an example of the variety termed by some writers "spurious melanosis," to distinguish it from the true, which is characterised by the pigment-granules.

In this case the excision of the growth, which was confined to the integument, was justifiable, as there were no secondary growths discoverable, and the patient seemed in tolerably good health; and had not the loss of blood before the operation and at the time of its performance weakened the reparative powers, this patient would have been relieved from a source of great local suffering and annoyance.

CASE XIV.—*Osteoid cancer of the forearm; amputation; recovery; death from secondary growths in the lungs.* (Drawings $5^{76, 77, 78, 79}$; Wax model 22^{5}; Prep. 1117^{30}.)

M. W—, a married woman, æt. 27, was admitted into Guy's, under my care, in September, 1855. She resided in Bethnal Green, and had been closely engaged in weaving. There were indications of a strumous diathesis, but her aspect was healthy, and her disposition calm, placid, and resigned. Her general nutrition was good, and she had enjoyed very good health. About July, 1851, or four years before I saw her, she observed a swelling in the lower third of the left forearm. This became very hard, but the surface was smooth, and the skin of normal tint. She had been married two years, and suckling one child the last eleven months. From the date of discovering the disease to parturition, slow but progressive increase of the tumour took place. Since the birth of her child, and whilst suckling, the tumour had rapidly increased. The shafts of the left radius and ulna were involved in a hard mass, which was rather nodulated. The carpal epiphysis of the radius did not appear to be involved. All the soft parts were spread over the growth, and the use of the hand and fingers was not materially impeded. Perfect pronation could not, however, be performed. At first, the patient experienced no pain, but of late, severe darting pains in the course of the branches of the nerves of the forearm had been complained of. The circumference of the corresponding points in the two

arms, and measured where the tumour is largest, is as nine inches to six and a half. As it was impracticable to remove the growth without irreparably damaging the arm, I proposed amputation, but not consenting to this, she left the hospital.

In May, 1856, she returned under my care. The growth had progressively increased, her general health was impaired, and her sufferings had been very severe. When closely questioned, she maintained that the primary growth seemed like a hard, moveable "kernel," as if in the skin, and not attached to the bone; that it was oblong, and elevated the skin. This account does not, however, appear consistent with the anatomy of the parts amputated. At this time the circumference of the largest part of the diseased arm in comparison with the corresponding locality of the other was as sixteen inches to six, so that seven inches in circumference had been added to the tumour in about eight months. The weight of the arm was distressing, and the pain produced by the pressure upon the trunks of the nerves prevented sleep. The lymphatic system of the member was quite free from disease, nor was there at this moment the smallest suspicion of thoracic disease. On May 13th, I amputated through the humerus, for the disease had encroached so closely upon the elbow as to prevent the formation of good flaps to the stump if the removal had been effected at the articulation. The sufferings of the patient were greatly relieved by the operation; the stump healed favorably, she slowly improved in health, and she left the hospital on July 8th, apparently convalescent. On the 26th of August, forty-nine days after leaving Guy's, she was admitted into St. Bartholomew's, and I am indebted to Mr. Thomas Smith for the concluding particulars of the case. "She was admitted for an attack of hæmoptysis, which lasted for a few days, but was not the first she had suffered from. At the time of admission she was spitting blood constantly, and occasionally losing it in gushes. She appeared to be dying from loss of blood and general debility. Under treatment, however, the bleeding ceased, but in a week or two returned, and continued up to the time of death, which took place on November 7th. During the whole of this illness, she complained of severe pain in the chest, especially on the left side. At the time of her admission,

there were moist sounds to be heard all over the thorax, but no dulness on percussion. After some time, a portion of the chest below the left scapula became dull, and remained so up to her death.

"*Sectio cadaveris.*—There was no disease found but in the lungs. The lymphatics in the axilla and elsewhere were healthy."

Now to the examination of the amputated arm. A vertical section was made through all the tissues. About an inch of the shafts of both the bones was destroyed. The soft parts remained intact, but the muscles and their tendons, the nerves and vessels were so disposed as to accommodate themselves to the growth. Some of these organs were surrounded by masses of the new growth, and thus traversed canals formed by it.

The new growth itself was composed: 1, of hard bony tissue; 2, of cartilage, in which ossification was advancing; 3, of fibrous tissue; 4, of fibrous tissue in which bone was developed; and 5, of a much softer new growth in which nucleated elements and fibre tissue abounded.

1. The hard bony tissue was of extreme density resembling that of ivory, and in its centre there was a large cavity, partially occupied with coagula. This bone exhibited all the characters of osseous structure, particularly those of the more dense kinds, such as the petrous bone of the temporal.

2. Scattered throughout the growth, but not in very large quantity, there was temporary cartilage, in which the process of ossification was recognisable.

3. The major part of the growth was composed of masses of a close, firm, fibrous tissue, varying from an inch to two or three in diameter. A section of them showed a peculiar radiating, or stellate arrangement of the fibre, and from between these fibres blood oozed out freely. On cutting this tissue, a gritty sensation was felt.

4. In a considerable number of these fibrous nodules, the progress of ossification could be observed by means of the microscope, and they were in various stages of hardness, or rather, perhaps, some had the bony element more developed than others.

5. Several tubercles of a softer consistence were developed upon the surface of the more fibrous parts, and in these the

nucleated elements and fibre-tissue of the more succulent varieties of fibroid growths were readily seen by the aid of the microscope.

Let us now turn to the examination of the lungs, a description of which I will give in the words of Dr. Wilks (Drawing 5[79]). Both lungs had new growths developed in them, and the one he examined "was full of a number of white, hard, rounded tumours, which when cut and pressed emitted no creamy juice, but merely a watery serum. Some were softened in the centre, and reminded one of the hollow in the original growth from the arm. Some were ossifying on their circumference, and thus showed a bony shell and fibro-nucleated interior. This was composed of a number of nuclei imbedded in a tissue which was translucent and faintly striated, so that it could be only said to be slightly fibrous. The nuclei were of small size, of irregular shape, although mostly oval, and contained one or two nucleoli. Some few were sprouting and sending off fibres. There was no appearance of large nucleated cells as seen in cancer, but the growth very much resembled the recurrent fibroid, or those described as fibro-nucleated and "malignant," from their occurrence in various parts of the body at the same time. It did not appear so much like an ossifying cancer, as an ossifying recurrent or malignant fibroid growth.

"The bony structure around consisted of ill-formed osseous tissue. The dark parts, as seen under the microscope, appeared to represent Haversian spaces, and around were arranged, more or less concentrically, the lacunæ. These were of unequal size, of ill shape, and sent off from their sides small, short processes, which hardly deserved the name of canaliculi."

In this new growth we find the osseous tissue developed in two ways, the one preceded by cartilage, the other by fibrous tissue. Here then, we have the representative of the processes adopted by nature in the formation of the flat bones of the head, and of the cylindrical bones of the extremities. These two processes are described by Dr. Sharpey,[1] but I believe that this is the first time the observation has been made in a new growth.

[1] 'Elements of Anatomy,' fifth edition, vol. i, p. cxlvii.

The chief features of this case are as follows:

The patient was twenty-three years old when the primary disease was first noticed.

The tumour had been growing four years and nine months when amputation was performed.

The woman survived the operation six months, and the discovery of the disease, five years and three months.

At the time of the operation, there were no physical signs of secondary pulmonary disease, nor at any time, not even post-mortem, were there any traces of disease in the lymphatic system. We can scarcely admit that so large an amount of new growth as existed in the lungs, could have been developed in little more than five months, therefore, I suppose, that incipient disease existed at the time, and which became more rapidly developed after the loss of the primary disease.

REMARKS

ON THE

WAX MODELS IN GUY'S MUSEUM

REPRESENTING

ROSEOLA CHOLERICA AND ROSEOLA VARIOLOSA.

By THE CURATOR.

Among the more remarkable models lately added to the Pathological Museum by our distinguished artist, Mr. Towne (since the completion of Addison's *Melasma supra-renale* and *Keloid*), are those designated by the above terms. We draw the attention of our readers to them, because we believe the diseases which they represent have never yet been illustrated either by models or by drawings.[1]

Roseola cholerica is the term applied to a rash which has been observed to accompany the secondary fever of a certain number of cases of cholera, in all the epidemics which have hitherto occurred in Europe, and has been described by English and continental authors at every visitation. These descriptions, although referring to an eruption which varies considerably in individual cases, so exactly coincide, that there can be no doubt an exanthem exists which is *sui generis*, and

[1] We had much desired to have accompanied this description by an illustration of the disease, but we feared that the smallness of our pages, as well as the difficulty in truthful colouring, would prevent us doing justice to the models, and so we have abstained from the possibility of conveying an erroneous impression of an eruption where correct colour was so necessary for its due comprehension.

We may here state that it was for the excellence of these models that Mr. Towne gained the medal, in the fine-art department, at the late Paris Exhibition.

bears an intimate connection with the disease. Notwithstanding these numerous observations, we conclude, both from the fact of the eruption being unknown in certain localities, and from its non-recognition by practitioners of experience in some of the larger provincial towns, that the exanthem is not so well known as it should be. It is for this reason that we draw the attention of our friends to these models, which so vividly represent the disease in its usual phases. According to our experience during the last epidemic, the rash appeared generally from the sixth to the tenth day (though sometimes later) after the first seizure. When the more urgent symptoms had passed, and reaction with its secondary fever had set in, there succeeded in the course of another day or two this peculiar eruption, appearing as an exanthem all over the body, but especially on the extremities. When in the most acute form, it resembled an urticaria febrilis, covering the trunk and limbs with large raised bright pink patches. In some cases the eruption was not so bright, but appeared on the skin in much smaller patches or spots, and in other cases the eruption consisted of a uniform mottling all over the surface, resembling measles or scarlatina. In one case, presently to be mentioned, the scarlatina-like rash followed the roseolous. Our experience during the last epidemic was not sufficiently large to allow us giving any per centage of cases in which an eruption was found, but we will briefly state the numbers as they occurred. In the autumn of 1854, there were 111 cases of true Asiatic cholera treated in Guy's Hospital, but of this number we can only speak with certainty of 84 which were placed together in the cholera wards. Of this number 39 were cured, and 45 died; and of the latter none had the rash, while of the 39 cured, 4 cases had the exanthem (not including a case of eruption on the face, which was styled erysipelas). We will enter into no statistical deduction of the proportion of exanthematous cases taken from these small numbers, for at once their value would be affected by treating of the 111 instead of 84; since, although we have no detailed account of the number 27, constituting the difference, yet we know confidently that in none of them did an eruption exist.

As it is important to show that this eruption is a characteristic one, or one at least *sui generis*, and intimately connected

with the choleraic malady, we think it advisable to quote the descriptions given by other observers at former epidemics, and it will then be seen how these models, which were taken during the last visitation, closely represent the accounts given by Reinhardt and Leubuscher, during the epidemic of 1849, and by Babington and Rayer, during the year 1831.

The first description with which we are acquainted, is to be found in the tenth volume of the 'Medical Gazette,' where, in a letter by Dr. Babington, dated August, 1832, on the cutaneous eruption in cholera then prevailing, that physician writes as follows:—

"In Russell's and Barry's official reports of cholera spasmodica, there is an extract from a report on cholera as it appeared in Moscow, in 1831, by Dr. Keir, at the close of which is the following paragraph: 'The more rapid and violent attacks of the disease were sometimes terminated by convulsions, and in a few cases, where biliary and intestinal irritation had prevailed, a cutaneous eruption resembling the nettle rash, or the measles, but with a larger spot, appeared on different parts of the body, and continued a few days. The patients under my care who were so affected, recovered.'

"I am desirous to direct the attention of the profession to this affection, of which I have now seen several examples.

"This eruption I have found to make its appearance in protracted cases of cholera, when the disorder has assumed that typhoid character which is marked by extreme debility, drowsiness not amounting to stupor, injected conjunctiva, and general indications of cerebral congestion. After this state has existed several days, some red spots are observed about the wrists and hands, and the face becomes tumid as on the approach of erysipelas. If this occur in the evening, on the following morning the arms, the forehead, up to the roots of the hair, and the face generally, will be covered with large elevated patches of a bright-red colour, more vivid than measles, and more defined than scarlatina, much resembling nettle-rash, especially in the circumstance of their disappearance on pressure, and instant recurrence when that pressure is removed. They vary in hue at different times, being occasionally purplish, especially on the hands, and again resuming their bright tint, without any apparent cause. On the second day, the efflorescence is found over the whole trunk and limbs, and the sensation produced by it is not that of tingling and heat alone, but of intense itching. To allay this, the patient scratches himself incessantly, until he has removed the cuticle in numerous patches over the body and extremities, leaving patches of incrusted blood and subsequent scabs wherever this abrasion has taken place. The eruption is very well marked about the third and fourth days, its outline around the edge of each patch being then more distinct than before, and bearing a greater contrast to the central portion. It declines about the sixth day, and terminates by a general desquamation of the cuticle. In this respect, as well as in its definite duration, it is needless to remark, that it differs altogether from nettle-rash. The constitutional disturbance is very great for a day or two before its occurrence, and continues to increase until it is at its acme. It is not

attended by sore throat, enlarged glands, or acrid discharges from the eyes or nose. In one case which I witnessed, the powers of the patient, who had previously been much debilitated, were unable to sustain this new cause of irritation, and he sank on the third day of the eruption."

Rayer, in his work on skin diseases, published in 1835, has the following:—

"I saw this variety of roseola during the epidemic prevalence of cholera in Paris, in 1832. After the period of reaction there occurred in some patients, especially in women, an eruption which most generally appeared on the hands and arms, and then extended to the lower extremities. At its commencement, it was characterised by patches, for the most part of an irregularly circular shape, of a bright-red colour, elevated above the surface, and but slightly itchy, very numerous on the hands, arms, and chest; they were less so on various other parts; in some places they were crowded together, tended to confluence, and had an appearance very analagous to the efflorescence of slight scarlet fever; in other places the aspect of the eruption was rather like that of measles; and in others even more like that of urticaria. I have seen the eruption complicated with an inflammatory affection of the fauces or tonsils, and its disappearance followed by an aggravation of the general symptoms, and sometimes even by death. On the chest the spots sometimes become confluent, and give rise to patches as broad as the hand, raised above the general level, and pretty well defined. The eruption then acquired a dirty pink or rose colour. About the sixth or seventh day, the epidermis cracked, and was thrown off in large flakes on almost all the places where the eruption had existed.

"*Example.*—A man, æt. 43, after eight days of collapsed state, reaction set in, and at the same time an eruption over the whole body, especially the belly and limbs, in broad patches, not raised, and like roseola; in some parts like scarlatina; on breast like measles; gradually vanished without desquamation."

Lastly, Reinhardt and Leubuscher, as quoted by Dr. Gull, in his cholera report, give the following account of the exanthem, as observed by them in 1849:

"We observed this, in many instances very characteristic rash, in fifteen cases. It appeared without any observable change in the general condition of the patient, without restlessness, heat, quickening of the pulse, or other symptoms generally dependent upon the development of an acute cutaneous eruption. In many cases, particularly in young and strong subjects, a diffused redness of the skin preceded the exanthem. It was particularly marked on the hands and face, where it was occasionally so bright and attended with so much swelling as to have the appearance of erysipelas. After twelve or fourteen hours, the swelling decreased, and the redness was more partial. In some places it gradually lessened, and disappeared altogether, whilst it continued unchanged in others. At this time there appeared over the hands and arms numerous large, irregular, and for the most part indistinctly defined, red patches. When the diffused redness and swelling were absent, the exanthem appeared first in the form of large, irregular, undefined erythematous patches. Sooner or later these became gradually concentrated into the exanthem. The skin

was then covered with small, round, defined spots, from the size of a pin's head to a linseed, more or less bright in colour, and not elevated above the skin. This gradual development of the exanthem could be best seen on the hands and feet; in other parts of the body it was not generally preceded by any diffused redness. The exanthematous spots subsequently increased in size, and when near together became confluent, and produced a roseolous appearance. In some cases the eruption remained in this condition, but increasing for twenty-four or thirty-six hours, and then after two or three days became pale, and disappeared altogether with a fine branny exfoliation of the skin. This abortion of the exanthem, if it may be so called, occurred in three out of fifteen cases; in these it was limited to the extremities, and principally affected the joints. The exanthem generally, however, underwent a further development; the spots became raised, and at the same time increased in circumference, forming an eruption like measles. By a further increase in size, and a greater elevation of the skin, wheals like urticaria were formed as large as a lentil or a silver penny. This similarity to urticaria was in some instances greater, from the wheals being in part paler in the centre than at the periphery. As the exanthem advanced, these wheals enlarged, at the same time their centres generally became depressed, and the edge was more raised above the skin. They either remained distinct, or were more or less confluent, as about the joints, elbows, shoulders, and knees. In this state the exanthem lasted from one to two days, sometimes from three to five, before it underwent any particular change. It afterwards became pale, gradually sunk to the level of the skin, and formed yellowish or reddish-yellow indistinctly-defined patches, which faded and were followed by exfoliation of the cuticle. For the most part this was in small branny scales, but in two instances where the rash was extensive, the cuticle, especially on the hands and feet, separated, as after scarlet fever, in large membranous laminæ."

We will now briefly refer to the models under review.

Models 83^{56} and 83^{58}, were taken from a young woman who, while convalescing from cholera, had a bright roseolous rash break out all over her body. The first model represents the outer part of the arm, and the second the back of the forearm and hand. Both are covered with large, roundish, well-defined, raised, bright pink patches, having a general resemblance to an urticaria febrilis, as sometimes met with in children.

Model 83^{57}, represents the front part of a forearm and hand taken from a young woman, æt. 20, who was admitted in a state of collapse, on Sept. 2d. On the 19th, when convalescent, a rash appeared all over the body. This was in the form of patches, which, as in the above case, were round and raised, but at the same time much smaller and less vivid. She left the hospital well on the 30th.

Models 83^{50} and 83^{55}, were taken from a young man, æt. 26, who was admitted into the cholera ward, on Aug. 2d, having been ill three days. On the 10th, he was covered with roseolous patches, resembling those of the first-named case. These rapidly faded, and made room for a general thick-set rash, which covered the whole of the skin. This resembled very much a scarlatina exanthem, becoming slightly purpuric, constituting the scarlatina maligna, for the colour, instead of being bright pink, was of a purplish hue and not raised from the surface. The first model represents the chest covered with this rash, having a somewhat livid hue. The second model is from the arm of the same person, exhibiting a rash of a similar character. On the 18th, the skin was desquamating exactly as is seen in scarlatina.

Of the fourth case of eruption, which occurred in our cholera wards, no model was taken, but the subject of it was a youth, æt. 19, and who, on the tenth day, was covered all over with a roseolous rash.

It will be seen that a tolerably uniform eruption has been described by all observers, and that our models from three different individuals represent its three most common varieties. In the first the eruption existed in large patches resembling roseola; in the next as smaller, more defined, and less vivid spots; and in the last as a rash closely resembling scarlatina. That the varieties in this exanthem should be repeated over and over again in the different epidemics, is perhaps more striking than if of a simpler and more uniform rash had alone been present.

Roseola Variolosa.

This rash, as far as our experience allows us to state, accompanies an abortive form of smallpox, that is, a disease in which the most violent constitutional symptoms of variola are present, together with the first indication of an eruption, but the latter suddenly ceasing after the evolution of the rash of which we are now speaking. It is well known that a roseolous rash often precedes the eruption of smallpox, and also that sometimes the latter becomes petechial,

and is rapidly fatal, constituting the malignant form of the disease.[1] The cases, however, to which we refer do not strictly come under either of these forms, as the roseolous rash was the only cutaneous manifestation of the disease, and upon its subsidence the whole of the constitutional symptoms abated, In one case, the rash resembled the more ordinary variolous roseola, though much more marked than usually seen; but in the other two cases it was very peculiar, and constituted the form to which we particularly wish to draw attention. The complete subsidence of the disease as the rash disappeared in these cases, was not surprising, seeing the patients had previously had smallpox or been vaccinated, and its peculiarities, therefore, might have been owing to this cause. We would not, however, speak too confidently on this point, since we see no reason why the eruption in some cases should not become rapidly petechial and have a fatal termination. In our cases, however, the patients were supposed to be proof against the disease, when exposed to contagion; but the most marked and urgent symptoms of variola came on, and at the same time this roseolous symptom appeared, either as the spotted variety, or in the remarkable manner of the cases mentioned below, where the hands and feet assumed a purple

[1] The writer, not long ago, had an opportunity of witnessing an instance of this fearful form of disease. Smallpox was introduced into a family of five children who had never been vaccinated. The first who was attacked, had the disease mildly; the second much more severely; the third had the semi-confluent form, and was in great danger; the fourth, a little girl, æt. 9 years, who had been in contact with her brothers and sisters for some days, but had as yet escaped, was now attacked by most violent symptoms of the disease. Soon the eruption could be felt beneath the skin, as a number of papules and a slight blueish hue pervaded it. When seen on the next day, the eruption was coming out, but surrounding each papule there was a dark purpuric zone. On the following day the eruption had appeared all over the body, and the surface was universally petechial; blood was issuing from the nose and mouth, and hæmorrhage occurred with the motions. The eruption never reached the vesicular stage, but the whole body became covered with ecchymosis, and was associated with hæmorrhages from all the mucous membranes; and thus the girl died five days after the first onset of the symptoms. The fifth child, an infant at the breast, although exposed all this time, escaped the disease.

A somewhat similar case occurred lately in the person of one of our students, who was seized with the most violent symptoms of smallpox, and shortly the eruption began to appear, but at the same time purpuric spots made their appearance on the skin, and a general hæmorrhage took place, which carried him off at the very onset of the disease.

hue; after this, the whole symptoms, constitutional and local, quickly subsided.

It has no doubt been remarked by many observers that those exposed to variolous contagion, even though they have had the disease, will suffer a certain amount of febrile disturbance. The readers of Sydenham will remember that that writer speaks of epidemic fevers which so closely resembled in their symptoms those of variolous pyrexia, that he did not hesitate to call them smallpox fevers, even though the eruption was absent. The late Mr. Harrison (our treasurer), in somewhat like manner, used to relate how an old nurse at the Smallpox Hospital, assured him that she always had the disease in a mild degree whenever she was more than usually exposed to the contagion, and she would say "I know that we now have some worse cases than usual because I have my eruption out upon me." It appears, then, certain that some influence may be exerted upon the body by the variolous poison, and that, although the system may be proof against its full development, yet may suffer a certain amount of disturbance, and evolve a cutaneous eruption. We would again say, however, that, although the cases under present consideration occurred in such a class of persons, we would hesitate to affirm that this would invariably be the case, and that the true form of smallpox might not commence in the same way. It is, however, especially to the remarkable form of disease below mentioned, that we wish to draw attention, as it appears not to have been hitherto described, although we may mention as a proof of its real existence and faithful portraiture, that an old practitioner at once recognised it in these models, as soon as they reached the museum, and before their distinctive names had been placed upon them.

Model 73[5].—Is the representation of the fore-arm and part of the hand of a woman who was covered with this roseolous rash accompanying the symptoms of smallpox. The history of the case was briefly as follows:

Sarah W—, æt. 54, had been a patient in the hospital for more than a fortnight, at a time when several cases of smallpox had broken out in the ward in which she was placed. She herself then was seized with the most marked symptoms

of the disease, and was ordered to be at once removed. Against this she protested, saying that she already had had smallpox very badly and could not have it again. She was, however, very ill, with the ordinary constitutional disturbance, and, at the same time, the hands became swollen and of a red colour, and a remarkably bright rosaceous rash appeared upon the inner side of both arms. On the following day, the roseola had nearly subsided, and the hands had regained their natural colour. On the next day, a crop of small pimples appeared on the chest and arms, which in locality and distribution followed very much the course previously occupied by the roseola, the eruption presenting both to the touch and to the eye the character of smallpox as seen on the second day. After this, the pimples died away, the patient was relieved of her symptoms, and she rapidly recovered.

Model 73^{10}, is the same arm at a later stage.

Model 73^{15}.—Represents the back of a child covered with roseate patches, and some enlarged papulæ as are seen at the commencement of smallpox. The case was as follows: John C—, æt. 13 years, a delicate boy, residing in the hospital premises, at a time when smallpox prevailed, had been vaccinated and scars were well marked on both arms. He had been ill a week before he was first seen, with general febrile disturbance and headache; and during the last two days, he was sensible of an irritation and itching all over, and soon observed little bumps coming out on the chest, afterwards on the back, and lastly on the thighs. When first seen, the eruption had lasted three days, was of a rosaceous character, and bright in colour, it was slightly raised and interspersed with enlarged papulæ. It was very full on the back and chest, but no appearance of turgescence on the hands. On the following day he was better, and the eruption was paler, and on the next it was fast dying off, and the patient appeared quite well. Slight desquamation occurred during convalescence.

Model $73^{20, 21}$.—Represent the hand with the fore-arm and foot of a man who came to the Hospital, in 1853, with the

most marked symptoms of smallpox. Edward R—, æt. 36, a cab-driver, had never had smallpox, but been vaccinated, and the scars on both arms were quite satisfactory. He complained of violent headache, and had all the symptoms strongly marked which usually precede variola. He stated that the eruption had appeared about twenty-four hours previously, and although very ill, had followed his occupation, his chief reason now for discontinuing it was that his hands would no longer close upon the reins in driving. His hands when first seen were of a red beef-like colour, and this, in a very remarkable manner, abruptly terminated at the wrists, contrasting most forcibly at this part with the natural flesh tint; the surface, also, was quite even, presenting none of the elevation existing in *erythema marginatum*. The rash was not one simply of colour, the hands being stiff and swollen, the surface undulating, tumefied, and slightly nodulated; not hard, but yielding to the touch, and conveying the idea of an undeveloped eruption beneath the skin; the most prominent parts were nearly colourless, arising from tension of the integument. Upon the wrists, just above the line where the deep colour ceased, there were several bright elevated spots, about the size of a threepenny piece; these looked like the commencement of roseola, and the arms and legs were dotted all over with small red pimples. The toes and insteps resembled the hands in colour, but were more slightly affected. On the third day, the hands were less swollen, of a darker and more purple hue, and presented very much the appearance of having been immersed in an infusion of logwood, and the colour terminated at a line almost as if it had been so produced. The spots on the wrists became flattened down, coalesced, and formed slightly elevated map-like patches, with bright margins and more livid centres, and the small pimples on the legs and arms became paler. On the fourth day, he was very much better, the symptoms had nearly all subsided, the eruption on the arms and legs was scarcely visible, the feet had almost regained their natural colour (though the hands still remained slightly red), and the patient indeed considered himself now well.

DESCRIPTION OF A CASE

IN WHICH

A URETHRO-VESICAL CALCULUS

WAS REMOVED.

By ALFRED POLAND.

The following interesting case has been considered of sufficient importance to be placed on surgical record; more especially as it bears some peculiarities in the form and location of the calculus, not generally or specially alluded to either in surgical works generally, or in special works on lithotomy and urinary calculi.

Space will not permit more than an outline of the case, with a description of the calculi, and a few cursory remarks; however, a short appendix of six recorded cases bearing upon the subject has been considered indispensable as an accompaniment to the paper.

The notes of the case are furnished by the then clinical clerk, Mr. William Venour.

Henry N—, æt. 20, a native of Essex, and for the last three years a resident in Southwark. He was brought up as a gunsmith, but since living in London has followed the employment of barman to a public house. He stated that from early infancy he had from time to time experienced uneasy sensations and pains in the back and urinary organs, which were always aggravated by cold or over exertion. During these attacks he had frequent micturition, and the water was high coloured, but had no deposit; otherwise he urinated copiously without

difficulty and without pain. Of late years he experienced pain in making water, which became more severe before and after micturition, and referred more especially to the end of the penis; it was attended at times with the involuntary discharge of the fæces. The bladder also required relieving every two or three hours.

About three months back he had an attack of orchitis, accompanied with slight hæmaturia, but which soon subsided.

Four weeks ago he over exerted himself in walking, since which period the urinary symptoms increased in severity, and became almost constant; at times causing temporary retention, and the admixture of a large quantity of blood with the urine. He had no vomiting or retraction of the testicle.

He was admitted into Guy's Hospital as a clinical patient, in July, 1854, under the care of Mr. Callaway. The man appeared much out of health, pale, irritable, and highly sensitive to pain; he complained of headache, had a furred tongue, a bad appetite, and slept indifferently; the skin was moist. He had constant desire to micturate, attended with great pain both before and after the act. The urine was neutral; sp. gr. 1025, coagulated by heat and nitric acid, and was loaded with a large quantity of thick ropy mucus. He expressed himself as easiest in the recumbent position on the right side. He had no cough nor expectoration, and the heart sounds were normal. He had never suffered from hæmorrhoids. A No. 8 sound was readily introduced into the bladder, and detected a calculus, both by touch and sound. Mr. Callaway ordered full diet, two pints of porter daily, and small doses of liquor potassæ three times a day, with morphia at night.

In the course of the following week his health improved somewhat, but his sufferings were very severe, necessitating the immediate performance of removing the source of irritation. As Mr. Callaway was taken ill at the time, Mr. Poland undertook the operation. The patient was put under chloroform, and placed in the usual position.

A straight staff was introduced, but was arrested at the prostatic portion of the urethra by the calculus; and on depressing the instrument it readily passed over it into the bladder. The staff, however, was withdrawn partially, and

allowed to rest on the stone. The usual incisions were made as in ordinary lithotomy—the laying open of the perinæum and the laying open of the urethra, with partial section of the prostate gland. The stone was then readily exposed, and after withdrawal of the staff, there were seized and removed with a pair of small straight forceps, first, a small loose calculus; and, secondly, a large calculus, having at its posterior and upper part an elongated pedicle, rough at its extremity, and evidently recently broken. The finger was therefore carefully introduced through the remaining undivided prostate and dilated neck of the bladder, into its cavity, and a third calculus there found at the base; this was readily extracted without further incision. Little or no hæmorrhage ensued, and the patient soon recovered from the effects of the chloroform. He was a little restless in the evening, and required a full opiate. Water flowed freely through the wound. On the following day he had improved in all respects, and was allowed a mutton chop and a pint of porter. He continued gradually progressing favorably; the bowels were at first inactive, requiring an occasional enema, and the wound at one time assumed an unhealthy aspect, there being sloughing phagedæna in the wound at the time. However, by dint of support, he rapidly convalesced. The water passed through the urethra on the ninth day. He left the hospital perfectly well, and with full control over bladder, at the end of four weeks.

Description of the Calculi marked A, B, C, *on the accompanying plate.*

Calculus A.—This is of the size of a French bean, and weighs ten grains; a section thereof was not made. The exterior consists of fusible calculus. It lay in front of Calculus B, and in close contact with it, both having smooth corresponding surfaces; the effects of attrition.

Calculus B.—The size of a large walnut, weighs 240 grains, having a remarkably short peduncle, passing from the upper and posterior part directly backwards; the extremity of which being irregular and broken, corresponding exactly with a similar roughness over the anterior part of Calculus C. A section has been made; the calculus analysed by Dr. Odling; he states: "The nucleus was uric acid—the exterior, fusible calculus with traces of oxalate of lime, which latter probably constituted the dark linear markings. The intermediate portion chiefly consisted of oxalate of lime, though with very small amount of uric acid, and mixed with earthy phosphates."

Calculus C.—The size of a broad bean, and weighing thirty-three grains; is somewhat flattened, and having on its anterior surface, at the upper part, a small rough projection which corresponds exactly with the extremity of the peduncle of calculus B, and had evidently been broken off during the operation of extraction, the fracture being quite recent. No section has been made.

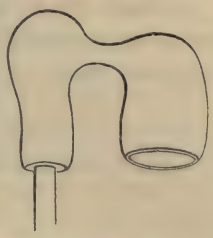
Remarks.—There is every reason to think the following explanation of the above case to be the most rational; viz., that whilst young, the patient had a small urinary calculus form in the kidney, that this passed down the ureter into the bladder, and subsequently escaped into the pouch of the prostate, where it became impacted, and made a bed for itself. Here it gradually grew and attained its present size. At some time, probably only a few years back, calculous deposition took place on the posterior and upper part, which gradually extended into the bladder by means of a small peduncle through the cervix, but when entering the cavity fresh deposition took place, and increasing to the size depicted. This, if left, would, in all probability, have formed another large calculus.

The small calculus (A), found in front of the larger stone, was an independent deposit, and lodged in a sac in the prostate.

The aggravation and remission of the man's symptoms were possibly owing to the slight occasional shifting of the calculus in its bed, during undue exertion.

This form of calculus may be appropriately termed the "urethro-vesical" or "prostato-vesical" calculus. It often assumes the shape, as in the present instance, of two calculi united by a transverse bar (see also Case I, fig. 1, and Case II, fig. 2), being like that of a bar-shot" or "dumb-bell," hence some have been disposed to have called it the "bar-shot" or "dumb-bell" calculus. We were at first inclined to give this appellation to our case; but when, on carrying our inquiry into the subject, as seen in the remaining appended cases (III, IV, V, VI), we found that this calculus considerably varied in respect to this shape, and that the bar or connecting medium between the two calculi was merely evinced by a constricted portion or kind of neck in the majority; so that the association of the name "bar-shot" with the character and situation of the calculus would not hold good in every instance. Thus, we prefer the present title as answering all intended purposes.

The Germans, as Dr. Bader, of Moorfields Hospital, informs me, have noticed this form of calculus, and he has seen one or two instances in the hospital at Vienna, but of which he has been unable to collect the particulars. The calculus assumed somewhat the shape of an inverted old-fashioned German pipe, viz., a bowl inserted into another smaller one for collecting the acrid watery solution. It was called the Pfeifenkop calculus.



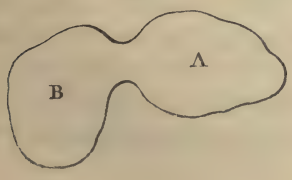
Dr. Lever, many years ago, drew attention to this form of calculus: he gave it the appellation of "bar-shot" calculus; and adverted to it in his lectures on vesico-vaginal fistula, in a case where a calculus formed on the vaginal side of the fistula, and attained some considerable size, connected by a bar of calculous matter, with another calculus situated in the bladder, which had also attained a large volume. The stone produced considerable irritation, but did not interfere with the flow of urine; in extracting it, the vesical portion broke off, which had to be removed afterwards. The calculus was said to be deposited in the Guy's Museum, but there is none such to be found.

These calculi are by no means so rare as might at first be anticipated. We have taken the liberty of collecting a few, and have placed them together with the present case, so that a more perfect idea may be obtained.

Case I.—Fig. 1. Calculus in the Museum of the Bristol Infirmary. Recorded by Richard Smith, Esq., among the plates of calculi to accompany a paper published in the 'Med.-Chir. Trans.' for 1820, vol. ii. A curiously shaped calculus. The anterior half (A) lay in the urethra. The whole is uric acid. B. Vesical portion.

This calculus approaches the nearest to the true dumb-bell shape or bar-shot-like "formation," and may be taken as the standard character, and all the other varieties that are here introduced are to be considered as more or less curious deviations therefrom.

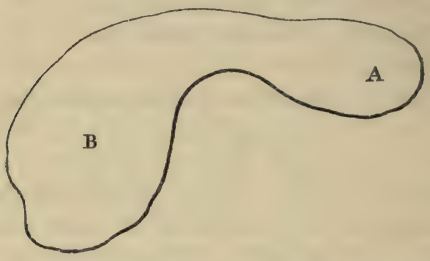
Fig. 1.



Case II.—Fig. 2. Dr. M'Laren, of Madras, has recorded in one of the weekly journals, the following case:

A child, æt. 7, had symptoms four or five years, very severe; no retention; excessive agony in micturition, and prolapsus ani; a catheter readily passed. On examina-

Fig. 2.



A. Prostatic portion. B. Vesical portion.

tion per anum the calculus was found in the bladder. Lithotomy performed, but great difficulty occurred in the extraction. The boy recovered.

Case III.—Figs. 3 and 4. A calculus of singular shape. Crosse, 'On Urinary Calculi,' p. 102 (plate ii, fig. 2).

Fig. 3. Fig. 4.

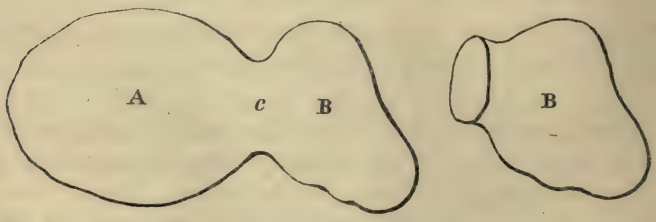


Fig. 3.—A. Vesical portion. Phosphate of lime, the nucleus oxalate of lime.
B. Prostatic portion. Phosphate of lime.
c. Portion at neck of bladder.
Fig. 4.—B. Prostatic portion; broken off during extraction.

Weighed ʒiv ϑj. Taken from a boy, æt. 6. The calculus broke during extraction, and the two pieces removed separately.

Case iv.—Fig. 5. In the 'Medical Gazette,' August 18th, 1855, Smyrna Hospital, Medical and Chirurgical Society, Mr. Atkinson relates the following case:

A Jew, æt. 21, had symptoms of stone nine years, which were latterly urgent; he could not stand erect, and had continual severe pain. The stone was felt at the prostate, when the sound was introduced, and having passed the prostate into the bladder a second one was apparently felt. On three subsequent occasions, the stone was felt impacted in the prostate, and various opinions expressed as to the presence of more than one stone. On the day of the operation the stone was in the

Fig. 5.

A. Prostatic portion. B. Vesical portion.
a. Lithic acid. *b*. Oxalate of ammonia.
c. Phosphate of ammonia.

bladder. Ordinary lithotomy was performed with a favorable result. Calculus weighed 18½ drachms.

Case v.—Figs. 6 and 7. 'Catalogue of Calculi in Royal College of Surgeons,' plate viii, fig. 14, page 64, b. f. 2.

Fig. 6. An external view of a remarkable but not very uncommon form of calculus, consisting of an oval portion (a) being lodged in the prostate, and an elongated cylindrical process (b) attached at an obtuse angle to one of its extremities, which extended into the cavity of the bladder. (c.) The narrow contracted portion, corresponding to the neck and orifice of the bladder. The small white mass (*d*) attached to the oval portion of the calculus was most probably formed in a

dilated cell or abscess of the prostate: it consists of the earthy phosphates.

Fig. 6.

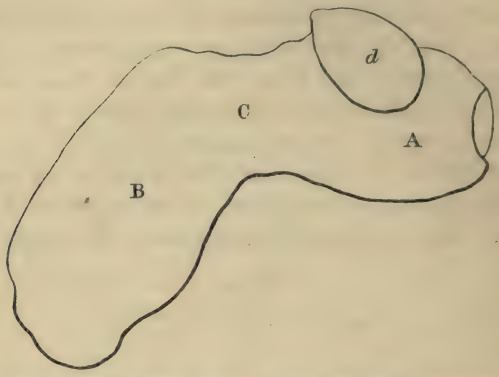
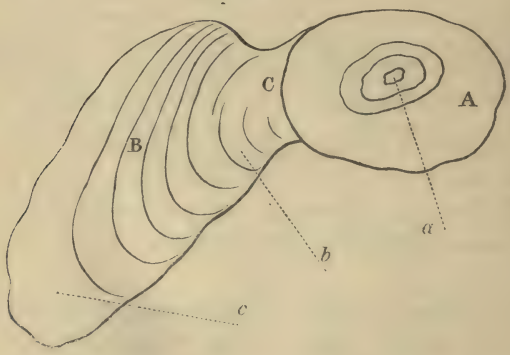


Fig. 7. Section of the above. The bulbous, or oval portion, has a nucleus (*a*) composed of urate of ammonia, surrounded by a well-defined deposit of uric acid; upon this the earthy phosphates form a thin coat. The long cylindrical process consists,

Fig. 7.

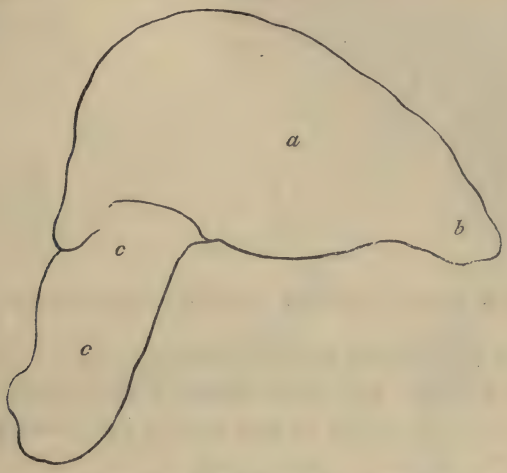


at that portion nearest to the calculus (*b*), of the earthy phosphates, with thin intervening layers of uric acid; its extremity (*c*) consists principally of the triple phosphate.

Case vi.—Fig. 8. Wm. Blomfield, 'Chir. Obs. and Cases,' vol. ii, plate x; also 'Catalogue of Calculi, Royal College of Surgeons,' p. 120. The following is the description given by Mr. Blomfield:

A very remarkable stone cut out of a lad in St. George's Hospital. Its appearance is not unlike the head and part of the neck of a turkey poult when prepared for the spit.

Fig. 8.



a. The part of the stone which was lodged in the membranous part of the urethra, which was consequently greatly dilated.

b. The beak, or that part which represented the bill of the bird, which had extended itself into the urethra where it is called the bulb.

c, c. This rough portion was continued through the cervix into the cavity of the bladder.

It is composed almost entirely of the mixed phosphates; of irregular layers of the earthy phosphates mixed with urate of ammonia.

Plate IX.

Mr. Poland's case of urethro-vesical calculus.

Fig. 1.—An imaginary sketch of the side view of a bladder, prostate, and penis, showing the probable position of the calculi, as met with in the operation:

A. Calculus No. 1.
B. „ No. 2.
C. „ No. 3.

Fig. 2.—A. Front view of calculus No. 1.
B and C. Calculi Nos. 2 and 3 united, but drawn with the upper part downwards, showing a section of calculus B.

Plate IX

Fig. 1

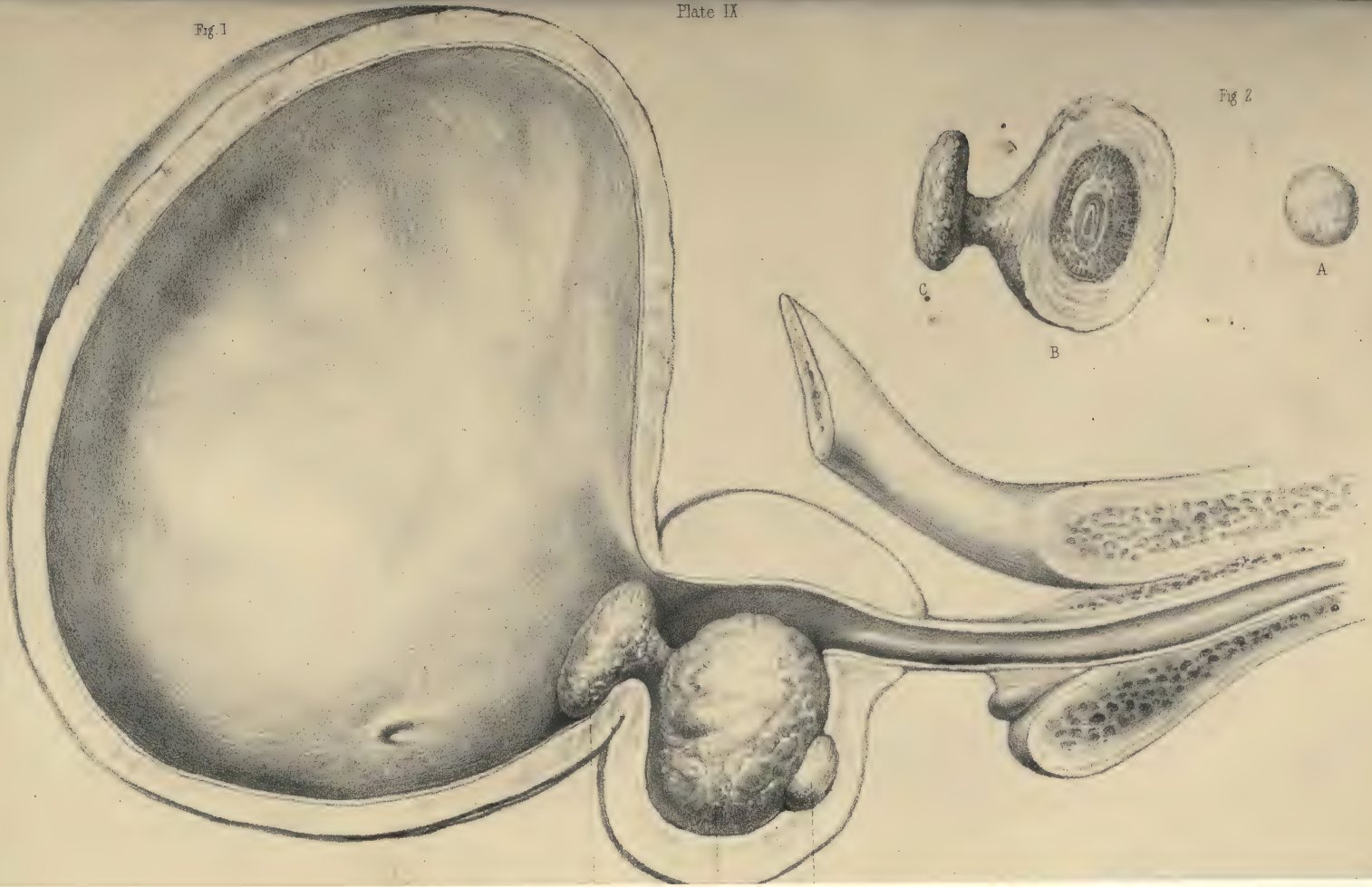


Fig 2

NOTE ON CASES

OF

BLACK URINARY PRECIPITATE.

By H. M. HUGHES, M.D.

In the last number of these 'Reports' I mentioned some cases in which the urine had been passed of a brownish-black colour by persons taking creosote, &c.; and also one (that of a little girl) in whose case the addition of nitric acid to the renal secretion, when boiled, was followed by a dense black precipitate, the chemical constitution of which was not ascertained. I also stated, that while the paper was passing through the press, I had a man under my care in the hospital, in respect to whose urine the same phenomenon was observed. The case is briefly as follows, from the notes of Mr. Catton.

J. G—, æt. 50, was admitted July 30th, 1856, under my care. His mother and three sisters had died from consumption. His habits had been moderately temperate, and his general health good. Ten weeks before he suffered from pain after taking food, and a month previously to his admission he first observed a swelling in the abdomen. He was a dark man, of sallow complexion. Below the region of the liver was felt a firm tumour, nearly as large as a twopenny loaf, which distinctly passed under the hand placed upon it, when the diaphragm descended, upon deep inspiration. He had never passed blood in his urine, or suffered from sickness. He complained of a continuous lancinating pain in the tumour;

his appetite was but poor, his bowels regular, and his sleep sufficiently good. Ordered—

Applicatur Tinc. Iodini tumori mane quotidie.
Potassii Iodidi, gr. ij, ex Julep. Ammoniæ, ter in die.
Opii, gr. ss, quaque nocte.

August 3d.—Upon boiling the urine, no coagulation occurred, but upon the addition of nitric acid, a dense, black, opaque precipitate occurred.

6th.—The urine presented the same peculiarities, and as it was suggested that they probably resulted from the iodine administered, the urine of several other patients who were taking that substance was examined, with the view of ascertaining whether this was the fact; but though iodine was clearly proved to be present in the fluid by the addition of starch, and though it became darker upon the addition of the acid, it presented none of the black precipitate existing in the case related.

9th.—The black precipitate has almost ceased upon the addition of nitric acid after boiling to the urine. In order to ascertain if iodine had any influence in producing the precipitate, he, and also another patient in the opposite bed, were ordered to take a double dose of their medicine on the morning of the 12th, and to save their urine for examination; but in neither case did the same phenomenon occur as had existed previously in the case of J. G—. It was now suggested, that the black precipitate might possibly be produced by iron, which, it had been ascertained, had been previously administered. The patient was therefore ordered—

Syr. Ferri Iodidi, 3ss, c. singulis dosib. misturæ.

19th.—The appetite had improved; the general health and the condition of the tumour were much as before. The urine, though, as on all previous occasions, proved to contain an abundance of iodine, still presented no trace of black precipitate upon the addition of nitric acid after boiling. He was ordered—

Liq. Potassæ, ℥xx, ex Cerevisiæ duplicis, Oss, bis die.

29th.—He had improved in health since the last report, and it was believed that the tumour was smaller. He wished

to go out, and did so after another examination of the urine, attended with merely negative results.

July 24th, 1857.—I have not seen or heard of this patient since he left the hospital. I think it may now be fairly assumed that this peculiar black precipitate does not depend upon the presence of iodine in the urine, as, at the termination of my former paper on this subject, I was induced to believe, upon the representation of one of my colleagues much more versed in chemistry than myself; as in no other patients taking this substance did it exist, and as in the case of this man, while he was persisting in the use of the same remedy, the peculiarity disappeared. Neither can it be supposed that it depended upon the presence of iron in combination with iodine; as, while the patient was taking both iron and iodine, its presence could not be detected; and as in the numerous instances in which the two have been administered, I have never, excepting in one other, observed this remarkable phenomenon. Upon what it does depend, I regret to state I am still unable to decide, but that it must be rare I think is certain, from the fact that, in nearly thirty years' experience in one of the largest hospitals of Britain, during which time, in many hundreds, perhaps thousands of instances, the urine has been examined by heat and nitric acid, and I never recollect to have seen, or even heard of it, except in the two cases recorded. It may be a bare coincidence; but I consider it worthy of record, that in both instances the patients were suffering from abdominal disease, which in the one case was of a scrofulous, but in the other is of still doubtful character.

SEQUEL OF A CASE

OF

SUCCESSFUL TREPHINING OF THE SKULL

FOR

RUPTURE OF THE MENINGEAL ARTERY

PERFORMED FIFTEEN YEARS AGO.

By EDWARD COCK.

The case is fully related in the seventh volume of the first series of the 'Guy's Hospital Reports,' so that I will here quote only the principal facts, leaving the reader to refer to the observations therein made with respect to the diagnosis, treatment, and other particulars.

John P—, æt. 46, a painter in the employ of Messrs. Maudslay and Co., was admitted into the hospital on September 2d, 1841. While at work he fell from a height of about seventeen feet upon a piece of iron which was lying on the ground below. He was stunned by the fall, but was recovering from the shock at the time he reached the hospital. A large scalp wound extended from the middle of the forehead along the vertex of the skull, and terminated a little to the left of the occipital tuberosity, and a flap was detached, so as to expose about the upper third of the left parietal bone; but no fracture could be detected. He had lost much blood. He remained conscious, and was so eleven hours after the injury, when he was able to get out of bed; four hours after this, he was found by the dresser in a state of perfect unconsciousness, with stertorous breathing and contracted insensible pupils. He continued to get worse and worse, and the case appeared nearly hopeless, when, judging from the nature of the accident and the symptoms, that it was one of compression from hæmorrhage, I deter-

mined to trephine. I was guided in my choice of locality for the operation by the fact, that on pinching the left arm and leg they were freely and readily retracted, while not the slightest motion could be excited in either extremity of the right side. A large piece of bone was consequently removed, above and behind the anterior inferior angle of the left parietal bone; a gush of blood immediately took place, and a portion of a large coagulum which existed between the dura mater and skull was removed. No fracture could be discovered. The deep stertor of the breathing almost immediately ceased, and on the following day the man moved his right arm and leg freely, and recognised his wife when she came to see him. He after this continued to progress favorably, the only drawbacks to his speedy recovery being some suppuration and exfoliation of bone.

He shortly resumed his work, and continued in full employment and in excellent health for thirteen years. I had frequent opportunities of seeing the patient after he left the hospital, and the following memoranda, extracted from my note-book, will serve to continue the case, as recorded in the volume of 'Guy's Hospital Reports' above mentioned, up to the period of the man's death.

May 16th, 1842.—Removed a portion of bone which had exfoliated from the margin of the trephine aperture. Is in perfect health, but says he has occasional pain about the opposite ear, and stiffness of the muscles below the mastoid bone. Insists that his mental and sexual powers are more vigorous than previous to the accident. Thinks it has "cleared his head."

June 12th, 1842.—Quite well; the exuberant granulations indicate a further portion of exfoliating bone.

January 31st, 1843.—Extracted a large portion of dead bone, about an inch and a half square, including a third of the circumference of the trephine hole. It was the entire thickness of the skull; the under surface unchanged, and marked by the dura-matral vessels.

March 12th, 1843.—Removed two small portions of bone. The wound filling up. A few minute fragments of bone have come away during the last few months.

November 5th, 1843.—The wound cicatrized, with a very thin pellicle of skin; the cicatrix pulsates. His health con-

tinues exceedingly good, and he is capable of undergoing great fatigue and exertion.

May 13th, 1849.—I have had frequent opportunities of seeing him during the last few years. He has continued in perfect health, following his employment, going up ladders, &c. He now informs me that a month ago he had a slight "fit," and that yesterday he had three fits, each lasting only a few minutes; that during the fits the right side of the face worked, and that the right hand was firmly closed. The right leg appears to have been but little, if at all affected. He was purged, and cupped nuchæ with great relief.

August 26th, 1849.—Had a similar attack a few days ago; otherwise in perfect health. Was again cupped.

October 14th, 1849.—Has had epileptic fits this week, affecting the right side. Was dry cupped.

During the next few years he continued to be the subject of occasional epileptic fits at irregular intervals, but still continued his employment, although the attacks became gradually more frequent and more severe in their character. During this period he was accustomed to seek relief from dry cupping.

The last memoranda of this case are from the notes of Dr. Gull, under whose care he was admitted into Guy's in February, 1855.

He is therein stated to be suffering from partial hemiplegia of the opposite side of the body to that of the injury; the face included in the paralysis, and the speech somewhat affected; also that he has some slight mental confusion. The patient then said that he had of late suffered from epileptic attacks, the fits being at five weeks' to three months' interval, and characterised by much irritability before the seizure, and almost complete unconsciousness for some hours afterwards. He never had any paralysis until after the last attack, which was six months before his admission into the hospital.

On August 30th, 1856, he was seized with an apoplectic fit, and shortly died. A post-mortem examination was made at his house on the following day, by Dr. Wilks, who adds the accompanying report:

The body was that of a stout, strong, healthy-looking man.

A scar was seen running from the left side of the forehead to the vertex, but the site of the operation was not observable until a careful search had been made, as the part was covered with hair, and was continuous with the surrounding scalp; it could, however, be accurately defined by the finger, which, by being passed over it, could detect the extent of the vacuity in the bone, the hard boundaries which surrounded it, and the soft, elastic, and easily compressible membrane by which it was covered. In order to remove the calvaria, it was necessary to leave the portion of scalp which closed the opening on the outside of the bone, and the dura mater, which closed it within, so firmly had these membranes become incorporated. Upon cutting through the portion of brain immediately beneath, and which was adherent by its serous covering to the dura mater, a large quantity of semi-coagulated blood fell out, and presently three or four ounces more issued from the ventricles. The latter, which were full of blood, communicated with the softened brain-structure at this part, and thus the section caused the whole of their contents to escape. This apoplexy, which was the immediate cause of death, by infiltrating all the structures in the neighbourhood of the injury, unfortunately prevented a full knowledge of the exact condition of the parts prior to its occurrence. The principal source of the hæmorrhage had been, probably, in the left corpus striatum or thalamus opticus, for at the right side these bodies were quite healthy, whereas on the left they were reduced to a pulp by the blood which was effused within them; the middle lobe of the hemisphere external to this was in a like condition, even as far as the neighbourhood of the original seat of injury, and therefore, as before said, when the latter part was incised the clots at once made their way from the ventricles. This region of the brain, when the blood was washed away, was no doubt the subject of old disease; the structure was soft and of a light-brown colour, and from so large a part being filled with blood, it was probable that a hollow space had been produced here by the *ramollissement*, that is, in the middle hemisphere, opposite to the hole in the skull, and reaching downwards to the base, and inwards towards the ventricles as far as the thalamus, whose surface also appeared to have been involved in the same chronic degenerative process. It appeared probable, then, that a softening had been going on for some

months in the middle hemisphere of the brain, involving the contiguous surfaces of the corpus striatum and thalamus, and that at last a rupture of a vessel had taken place, infiltrating all these diseased structures as well as the ventricles.

The softening which favoured the final hæmorrhage was no doubt due to the state of the blood-vessels, which were found extremely diseased throughout the brain; the patient remaining so many years in good health sufficiently proves that the cause of the softening was to be found in them rather than in the original injury. Why this part of the brain was the principal seat of the impaired nutrition need occasion no surprise, since it is well known that injured parts, from the altered circulation or other causes, do often remain permanently weak. A disturbance in the circulation, or an imperfect supply of blood to the brain, might very readily be conceived to have set up a decay in this part rather than in any other.

As regarded the original wound it was not replaced by the growth of any new bone, but the trephine opening was filled by a tough membrane composed of the integument on one side and the dura mater on the other. These were firmly blended together, and formed a sufficiently strong protection to the brain; they were strongly united to the edges of the opening; the latter being rounded, with smooth edges, and was a little more than an inch in diameter. At its upper part there were two deep depressions, whence, probably, the diseased bone had proceeded, and there was evidence of a considerable ostitis having occurred all around the site of the trephining, particularly at its front part. Here over the left protuberance of the frontal, the bone was more than twice as thick as the corresponding part of the opposite side. For about two inches around the opening, the dura mater was closely adherent; and upon removing it, the inner surface of the skull was seen to be covered with a number of bony points or granulations. Immediately in front of the trephine hole there was a depression in the bone, which extended upwards and downwards for a length of three inches. It was caused by the ridge of new bone immediately in front of it, and might, with some possibility, have been the site of a fracture which took place at the time of the injury; from the great change, however, in the structure of the bone, it was impossible to prove this satisfactorily.

ON

POISONING BY TARTARIZED ANTIMONY;

WITH

MEDICO-LEGAL OBSERVATIONS ON THE CASES OF ANN PALMER AND OTHERS.

By ALFRED S. TAYLOR, M.D., F.R.S.

It is well known that had William Palmer, of Rugeley, been acquitted on the indictment for the murder of John Parsons Cook, he would have been put upon his trial for the murder of his wife, Ann Palmer, by poisoning her with Tartarized Antimony. His conviction on the charge of murdering his friend rendered it, however, unnecessary to institute a judicial inquiry into the scientific and moral evidence by which it was intended to prove that his wife had also died from poison, and that by his hands the poison had been administered. Poisoning by antimony is, comparatively speaking, rare; and the precise mode in which there is reason to believe the life of Ann Palmer was destroyed, had not, so far as I know, ever before been made a subject of legal investigation on a charge of murder in this country.

For this reason, probably, the opinions expressed by Dr. Rees and myself at the inquest held on the body of Ann Palmer at Rugeley, on the 14th January, 1856—that this lady had died from the effects of small, or medicinal doses of tartarized antimony, was by some members of the profession regarded as contrary to all experience on the action of this drug, and therefore, medically speaking, inadmissible. We were reminded that tartarized antimony was in daily use in the treatment of disease, and that it had been given in

large doses to a considerable extent by Rasori, Tommasini, Laennec, and others, not only without ill effects, but with positive benefit to the patients. For many months, letters appeared either in the daily papers, or in the weekly medical journals, testifying, according to the experience of each writer, that tartarized antimony was *not a poison*, and could not destroy life so long as a medicinal dose was not exceeded; and even asserting the perfect safety of large doses by reference to the practice of the Italian school of Contrastimulists. With a view apparently to meet and refute our opinions at the future trial, experiments on animals were performed by gentlemen employed for the defence, and the result was stated to be, that so far from this substance exerting a poisonous action, the animals throve and took their food with unabated appetite! Had the case of Ann Palmer come to trial, much of the medical sophistry thus thrown over a question of serious importance to society, would no doubt have been exposed and refuted.[1] But it speedily met with a practical refutation in the trial and conviction of a woman (Macmullen), at the Liverpool Summer Assizes, in 1856, for causing the death of her husband by the administration of small doses of tartarized antimony; and more recently at the Lancaster Summer Assizes, 1857, in the trial and conviction of a man (Hardman), for the murder of his wife, by similar means.

The two criminals in these cases followed the example of William Palmer. Distrusting the theory of those medical writers who had furnished the elements of an unsound medical defence to the daily newspapers, they simply adopted the practice, and with like results. The husband in the one case, and the wife in the other, undeniably fell victims to a mode of poisoning which these writers had so recently pronounced to be impossible. On neither of these occasions had

[1] Some months before the trial of Palmer for the murder of Cook, the question was put to me by a learned judge whether tartarized antimony was a poison. He had been informed by a member of the profession occupying a very high position in the metropolis, that it was *not* a poison. Great pains were taken by the attorney for William Palmer, acting as he said on the advice of eminent medical men, to imbue the public mind with the doctrine that *medicinal doses* of tartarized antimony had never been known to kill a human being, and *therefore* would not destroy life! Further, that a medicinal dose, as he was instructed, would be comprised between half a grain and half an ounce!

they the moral courage to stand forward and protest against convictions for that which, in their opinion, must have been an impossible crime. It is not credible that this specious defence of Palmer was based solely on the consideration that he was a member of the medical profession, and that he required special protection by medical theories; but at the same time it is difficult to understand why medical men should voluntarily publish opinions which they have not the courage to maintain when a practical necessity arises, and human life is at stake. Either persons can be killed by medicinal doses of tartarized antimony, or they cannot. If they can, then the professional letters written by these zealous partizans in defence of Palmer before his trial, were a mere imposition on the public; on the other hand, if persons cannot be thus killed, there have not only been two judicial mistakes in the convictions for homicide by this drug, but all medical experience on the matter must be false, and the alleged fatal cases must be regarded as mere inventions for the persecution of a "professional brother."[1]

The mode of criminally administering antimony selected by William Palmer has then already had imitators, and it is likely to have more. It can hardly be said that the practice originated with him, for it is stated on good authority that Dr. Castaign who was convicted and executed in Paris, in 1823, for murder by poison, and more recently, the notorious Wainwright, who had speculated in life-insurance by means of poison, had first dosed their intended victims with tartarized antimony. In the case of Castaign, this substance was proved to have been purchased by the criminal at the same time as the alkaloidal poison used for the perpetration of the murder.[2] It is probable even that this mode of destroying

[1] The fraternizing terms applied to Palmer by a medical journal, 'Assoc. Med. Journal,' May 10, 1856.

[2] When we read the imperfect accounts of symptoms and appearances in some of those cases of poisoning which struck so much alarm in the minds of people during the seventeenth and eighteenth centuries, we are forcibly reminded in some of them, of the effects of tartarized antimony in small and repeated doses. Pitaval an authority quoted by Beckman, (i. 59), in reference to the criminal poisonings of the Marchioness of Brinvilliers, thus describes the deaths of two persons alleged to have died from poison. "The lieutenant-civil continued still to grow worse. After having languished a long time, being seized with a *loathing* of every

life has been secretly carried on for some time in this country, and that it has hitherto escaped the notice of the profession. The symptoms do not always present a well-marked character, and in the absence of an examination of the dead body, no suspicion may exist that death has proceeded from other than natural causes. Death from small doses of tartarized antimony may be easily referred to inflammation of the stomach, bilious cholera, or to wasting chronic disease. The body of Ann Palmer had been lying fifteen months in the grave under a regular professional burial certificate of death from bilious cholera, when the sudden death of Cook, and the detection of antimony in his body, led to the exhumation of the body of this lady. It was then only for the first time ascertained, that there existed in the body a cause for the symptoms which had not been even suspected during the last illness of the deceased. How many more may have died under similar circumstances, whose deaths may have been caused by the secret administration of this mineral, and are registered as deaths from natural disease! But for the fact that, fifteen months afterwards, Palmer was led to the commission of another murder, the cause of the death of the wife would probably never have transpired; and there is still a dark shadow of mystery hanging over the deaths of his wife's mother, his friend Haden, and three children, all of whom, as I am informed, had died under his roof, and under his medical superintendence! The evidence in the case of Macmullen, which will be noticed hereafter, showed that some druggists in Bolton and other localities, have been in the habit of selling

kind of food presented to him, his *vomitings* still continuing, and nature being at length *exhausted*, he *expired without any fever*. The three last days he had *wasted* very much; he was become extremely shrunk, and he felt a *great heat* in his stomach. When opened, that part and the duodenum were found to be black and *sloughing off* in pieces (aphthous desquamation?); the liver was mortified and as it were burnt. The counsellor was ill three months, had the like symptoms as the lieutenant-civil, and died in the same manner. When opened, his stomach and liver were found in a similar state." Making due allowance for imperfect description, and the effects of putrefaction in the dead body, the reader will find that the symptoms and appearances are similar to those described hereafter as a result of poisoning by antimony. The criminal wisdom of one generation is the ignorance of another. The mediæval art of poisoning consisted rather in the skilful mode of administration, than in the more potent nature of the substance used.

to women tartarized antimony in doses of a few grains under the name of "quietness powders," for the express purpose of administration to their husbands, with a view to cure them of habits of drunkenness! It is at present easily accessible to all classes; and the following fact, communicated to me by a professional man soon after the inquest on Ann Palmer, shows that a knowledge of the mode of using this substance so as to produce the greatest injury to health with the smallest risk of detection, is pretty widely diffused. It happened some years since, an elderly lady, the widow of a clergyman residing in the country, suffered for many months, at intervals, from nausea and frequent vomiting. She became much reduced in strength and emaciated, and at length it was feared that she must die before long, when it was accidentally discovered that her servant, without any apparent motive, was in the habit of administering to her in her food, small doses of tartarized antimony. This was confirmed by the girl's confession, and, after her dismissal, the patient gradually recovered her health.

In the case of a lady, in which I was consulted in April, 1857, the suspicions of the medical attendant were excited, and the attempt at secret administration was discovered and frustrated. This lady suffered from extreme irritability of the stomach, and sickness; the vomited matter, of which a portion was sent to me, had an intensely yellow colour from admixture with bile. There was slight, unconnected wandering, no sleep, paleness of the countenance or flushing, swelling of the face, injection of the eyes, an aphthous state of the tongue and mouth, soreness and constriction of the throat, with pain and a burning sensation in the region of the stomach, and tenderness in the abdomen; there was a sense of loss of power, and coldness from the waist to the toes, and a tingling sensation in the upper and lower limbs, with slight muscular spasms in the arms and hands. There was irritability, with soreness of the rectum, and movement short of diarrhœa. There was some difficulty and pain in passing the urine. The pulse was generally low, and from 120 to 132. The most prominent symptom was *a constant feeling of such depression that death seemed to be close at hand.* The treatment pursued appeared to produce very little effect on these symptoms. A portion of

the patient's urine was sent to me for analysis; it was found to contain *antimony*, and the cause of most of the symptoms, as well as of the dangerons condition of this lady, was then revealed. The medical attendants had prescribed no antimonial medicine at any period of the treatment; and it was clear, from the chemical result, that the metal was then actually in the process of elimination from the system. The detection of antimony confirmed their suspicions, based on the anomalous symptoms, as well as on moral circumstances; and I am informed there was reason to believe that a death which had occurred in this family in 1852 might be referred to this cause. They took a proper course, by informing the members of the family, and the patient was thus protected against this secret administration of poison.

It is clear from this and similar cases, that if there is great facility for slowly undermining health and destroying life by the administration of small quantities of tartarized antimony at intervals, there is equal facility on the part of a cautious medical practitioner in detecting and exposing the attempt. His suspicions may be fairly excited when there is nausea, with retching and vomiting, soon after taking articles of food or medicine, the illness supervening suddenly without any sufficient natural cause to account for it—when the vomiting is of a bilious or mucous character—when there is soreness or constriction of the throat, with such extreme depression that the patient appears sinking. An examination of the urine, which is not usually removed by those interested in concealing the facts, will reveal the attempt even with more certainty than the vomited matters. Unless these are procured soon after the antimony has been swallowed, the mineral may not be detected in them.

In the present state of medico-legal science, however, a medical practitioner who had the knowledge to detect, and the courage to expose a crime of this nature, would find himself surrounded by difficulties. It would be alleged that the discovery of antimony in a dead body proved nothing; it might have been the result of some lawful administration many years previously:—unless found in an impossible quantity, *i.e.*, unless enough metal were separated from the tissues to destroy the life of another human being, it would be solemnly affirmed

that there was not a fatal dose, and therefore the deceased could not have died from it; if found in the liver, the heart, or kidneys, this fact, it would be contended, did not prove absorption during life, but merely imbibition from the stomach after death; if found in the contents of the stomach and bowels, this, it might be urged, would not prove that any portion had been taken recently before death, but simply that the mucous membrane of the stomach and bowels was an eliminating surface to the liver and kidneys: and as to its presence in these organs, medical theories would be satisfied provided it could be proved that antimony in some form or other had been taken by the deceased at any antecedent period of life! The facts—that antimony was found in all the tissues—that none had been prescribed by the medical attendant during the illness of the deceased, that the nature of the illness was such as to have forbidden its use, would be considered unimportant; and the illness itself, although presenting such symptoms as might be produced by antimony, would be attributed to natural causes. It is proper that every reasonable theory or explanation of medical facts should be exhausted before we adopt the conclusion that antimony found in a body has caused death; and, on the other hand, we have a right to expect that the presence of antimony, in however *small* a quantity, as it is not a natural constituent of the body, shall be reasonably and satisfactorily explained. Sophistical and irrelevant scientific objections taken to medical evidence on grounds such as those above-mentioned, by objectors who have either no knowledge of the facts of a case, or who ignore or misrepresent them, may have the temporary effect of confusing a criminal court, and procuring an acquittal, but they produce the lasting evil of encouraging secret murder by poisoning, and discouraging its detection and exposure.

The object of this paper is to examine some of the medical questions connected with antimonial poisoning, on which a great discrepancy of opinion appears to exist among members of the profession, and to illustrate the present state of medico-legal knowledge by reference to several cases which have come before our legal tribunals.

History and Nature of Tartarized Antimony.

The earliest account of antimony is found in the writings of Basil Valentine, who lived about 1415. He made this metal the basis of all his medicines, and called it *omne in omnibus*. From the universal and rash employment of these compounds many accidents no doubt arose, and this may have led to the proscription by the parliament of Paris of the use of antimony in the Materia Medica during a whole century, *i. e.*, from 1566 to 1666.[1]

Cuvier assigns as a reason for this proscription, that antimony was used under circumstances which rendered it a dangerous and uncertain medicine. Wine and other liquids were allowed to remain for variable periods in vessels made of or containing glass of antimony, and accidents arose from the large quantity of dissolved antimony occasionally taken at a dose. Medical practitioners regarded and called it a *remedium in extremis*, and Guy Patin applied to the compound with tartar the name Tartre Stygié, in place of Tartre Stibié.

Tartarized antimony appears to have been introduced into the Pharmacopœia of the London Royal College of Physicians in the year 1721, under the name of Tartarus Emeticus.[2] It is stated to have been discovered by Adrian de Mynsicht, a Dutch chemist, in the year 1631, but there is no evidence that a salt of the precise composition of tartarised antimony was known, at least in England, until a much later period.[3] Magendie states that it was much used, in common with other antimonial preparations, by the members of the Academy of Medicine, in the year 1666; but in an English Pharma-

[1] Pereira's 'Materia Medica,' 4th ed., vol. ii, part 2, p. 858.

[2] Phillips's Translation.

[3] The formula of Adrian de Mynsicht was as follows:

℞ Olei vitrioli veneris et martis rubicundissimi; Reguli antimonii āā ℥ij
Mercuri loti et purgati . . . . . ℥ss

"Minutissimè contere et in cucurbitam mitte super ignem impone et lento igne digere. Adde spiritum vini tartarizatum. Est maxime accommodatum corpori humano arcanum: hæc est nobilissima medicina cum spiritu propriatâ ('Thesaurus Medico-Chemicus,' Hamburg, 1631.)

Some tartrate of antimony may have been here produced, but not the tartarized antimony of modern times. This formula no doubt led to its discovery.

copœia of the date of 1677 there is no notice of it, although other antimonial compounds are introduced.[1]

In an edition of Boërhaave's 'Chemistry,' of the date of 1727, this preparation is not noticed.[2] The oxides, chloride, and other compounds of antimony, are, however, described as poisons by this old writer. It is clear that tartarized antimony could have been but little known in his time, as from the copious details which he gives of the chemical substances used in pharmacy, it would certainly have found a place in his treatise. The noxious properties of the oxides and sulphuret of antimony had, however, been long known.[3] Owing to their insolubility and comparative inertness, they are far less adapted to secret administration, than the preparation which we are here considering. From its first introduction into the London pharmacopœia, about one hundred and forty years since; tartarized antimony has been extensively employed in medical practice, and is well known as a most useful medicine in the treatment of numerous diseases. Like all remedies, it has passed through various phases of popularity, some condemning it as unsafe, and others relying upon it almost exclusively, as a valuable specific. Towards the close of the last

[1] 'Pharmacopœia Collegii Regalis Londini,' Lugduni Batavorum, apud Johannem A. Gelder, MDCLXXVII.

[2] 'A new method of Chemistry, including the theory and practice of that Art,' 4to, London, 1727.

[3] The MARCHIONESS of BRINVILLIERS, with her infamous accomplices Sainte Croix and La Chaussée, were acquainted with the properties of antimony. Corrosive sublimate, regulus of antimony and vitriol were found in a casket belonging to Sainte Croix; and it is not improbable that they used the regulus of antimony for preparing the compound discovered about forty years previously by Adrian de Mynsicht. Sainte Croix was probably acquainted with some of the more subtle compounds of arsenic recently described by Bunsen. He was accustomed to wear a mask while working in his laboratory, and on one of these occasions, owing probably to the accidental escape of some poisonous vapour, he was found dead. His death, and the subsequent confessions of La Chaussée, led to a knowledge of the criminality of the marchioness. La Chaussée was broken alive on the wheel, in 1673, and the marchioness, who in the mean time had fled from justice, was convicted and beheaded on the 16th July, 1676. Her body was afterwards burnt. In a written confession, she admitted that she had put to death a greater number of persons than any one had ever suspected. By making use of La Chaussée, she poisoned her father and her brother, admitting that, to the former, *ten doses* of poison were given before he died. The reader will find some curious information on secret poisoning in Beckman's 'History of Inventions,' vol. i, p. 47, Ed. 1846.

century, it was adopted as the chief remedy of a sect of Italian physicians, represented by Rasori, known as contra-stimulists. They prescribed it in unusually large doses, and their practice is only of medico-legal interest in this respect, that it has been erroneously brought forward in recent times to prove that tartarized antimony is not a poison.

Tartarized antimony is a white crystalline solid, composed of tartaric acid, potash, and oxide of antimony. It contains about 43 per cent. of this oxide, to which its medicinal and poisonous properties are due; and this quantity of oxide (SbO_3) corresponds to about 36 per cent. of metallic antimony. It is necessary that this should be borne in mind, inasmuch as the quantity of metallic antimony found in a dead body has been erroneously assumed to represent an equal weight of tartarized antimony, whereas, every 3·6 grains of the metal represent 10 grains of the antimonial compound. Tartarized antimony is the only soluble preparation of the metal which is used internally as a medicine. It is sometimes administered in the form of powder; on other occasions, in a state of solution in water or other liquids. It is soluble in water at 60°, in the proportion of thirty-one grains to the fluid ounce. The pharmaceutical solution (antimonial wine) contains this substance dissolved in the proportion of only two grains to the fluid ounce. The taste of the powdered crystals is described by the late Dr. Pereira as feebly sweetish. I have perceived in the powder and concentrated solution a strongly metallic taste. The ordinary antimonial wine has no taste derivable from the presence of this substance, and I find that a solution prepared by dissolving two grains of the powder in one fluid ounce of distilled water has no taste. This compound presents even greater facilities than arsenic for secret administration in small doses. It is much more soluble than arsenic; it is either quite tasteless in small doses, or its taste is readily concealed by any liquid article of food or medicine; and thus it may be criminally administered without exciting suspicion. There is also another point in which it differs from arsenic. By its greater solubility and its specially emetic and purgative powers, it is more easily expelled from the stomach and bowels than arsenic; and thus, unless a person has taken a dose within a very short period of death, the quantity found

in these parts of the alimentary canal after death, will necessarily be small.

It is proper to notice here that the crystals of tartarized antimony occasionally contain traces of arsenic. I pointed out this contamination about nine years since,[1] and quoted a case in which it had given rise to some embarrassment in chemical evidence. Two cases have since occurred in this country in which, although antimony was believed to be the cause of death, minute traces of arsenic were found associated with antimony in one of the organs of the body. The source of this contamination is to be traced to the presence of arsenic in the proportion of from 1-60th to 1-20th of its weight in all the German and French sulphide of antimony. Metallic antimony contains from 1-50th to 1-200th. The crystals of tartarized antimony which are first formed are free from this impurity; but, according to Martius, the larger crystals which are principally formed in the mother-liquid contain arsenic.[2] The use of arsenical sulphuric or hydrochloric acid in the preparation of the compound may also furnish an additional source of contamination. Orfila attributes some of the severe symptoms occasionally produced by antimony to this contamination with arsenic.[3]

2. Action of Tartarized Antimony in small doses as a medicine and as a poison. Chronic poisoning.

There are few pharmaceutical compounds which have a more variable action than this. It has been used with great effect as an astringent to arrest purging in diarrhœa and cholera, in doses of from 1-16th of a grain every two hours to 1-10th of a grain every half hour. Dr. Billing, who has recommended the use of this agent as an astringent, observes: "it will surprise some to learn that tartar emetic, as a general sedative remedy, will allay sickness. For example, inflammation of the mucous membrane of the intestines is accompanied by nausea and sickness; these symptoms may be checked

[1] On Poisons, p. 491.

[2] Gmelin's 'Hand-book of Chemistry,' vol. iv, p. 317.

[3] Traité de Toxicologie, i, 616, 5me ed., 1852.

sometimes without bleeding by frequently repeated small doses of tartar emetic." He relates the case of a patient admitted into the London hospital, who had been labouring under diarrhœa and vomiting for two days, for which he had taken chalk-mixture, catechu, and opiates unavailingly. His skin was hot and dry, with wiry pulse and dry tongue. He prescribed for this patient 1-16th of a grain of tartarized antimony every two hours. The man did not vomit after the second dose, and rapidly recovered.

This experienced physician attributes the efficacy of antimony as a remedy in inflammation to its astringent effect on the capillary vessels, as well as to its sedative effects on the heart and pulse.[1]

In doses of from one twelfth to one sixth of a grain, tartarized antimony promotes perspiration and expectoration; of from one fourth to half a grain, it causes nausea; of from one to two grains, it acts as an emetic; and in doses of from one to four grains, every two or three hours (on the contra-stimulus mode of treatment), it produces at first nausea, pain, vomiting, and purging, afterwards followed, in certain constitutions and under certain states of disease, by an arrest of these symptoms and a beneficial medicinal action. This medicine is observed to exert a powerfully depressing influence on the action of the heart, producing a feeling of sinking, and giving to the patient the sensation of extreme exhaustion and of impending dissolution. Of all emetic substances known in medicine, tartarized antimony produces the greatest amount of nausea and depression.[2] Besides the depression of the nervous functions, there appears to be a relaxation of the tissues of the muscles, so that the patient has a feeling of great feebleness, and is incapable of any exertion. In repeated doses, it increases the secretion of the mucous membrane of the stomach and bowels, as well as of the kidneys, liver, and skin, causing often profuse perspiration, while the skin may be at the time cold. The increased secretion of mucus and bile is in general indicated by the appearance of the matters thrown off the stomach or bowels.

It is obviously impossible to fix any boundary between the

[1] Principles of Medicine, pp. 103—106.

[2] Pereira's 'Materia Medica,' vol. i, p. 747.

medicinal and poisonous action of this compound, or between a medicinal and poisonous dose. The age and constitution of the patient, even in cases in which the same dose is administered, influence the result. Infants appear to be especially predisposed to the noxious action of this drug, and some adults suffer, from an ordinary dose, symptoms and effects of a very severe kind.

It may be stated generally, that a medicine in a large dose is a poison, and a poison in a small dose is a medicine: hence there can be no definite boundary between a medicine and a poison. The greater number of substances described as medicines, may act like poisons according to the dose or circumstances under which they are administered. The proof of the crime of poisoning should rest, therefore, upon the intention with which the substance is administered, as well as on the effects produced. A man may administer tartarized antimony in *medicinal* doses with good or evil intention. His intention may be not to remove disease, but to destroy life. He may administer it secretly, under circumstances in which its lawful use would certainly not be required: he may continue to use it at intervals in medicinal doses, even when its dangerous effects are clearly manifested by symptoms, and when any medical man, dealing *bonâ fide* with a patient, would, if he had prescribed it, immediately withdraw it as a medicine. Is such an act as this to be covered by that thin veil of medical sophistry which was spread over it in the case of William Palmer, apparently because he was a man of education and a member of the medical profession? Is it to be received as a reasonable or safe doctrine for society, that tartarized antimony is a medicine and not a poison, because it has been given in some instances in large doses, without causing death? Or, that provided the doses are what may be called "medicinal," there can be no act of poisoning? If a criminal act of the worst dye—the professional use of remedial agents to destroy life—is to be thus frittered away by a definition, murder by poisoning might be carried on with impunity throughout this country, whenever a motive for crime presented itself; and the greater the skill and the more perfect the cunning used in the perpetration of a crime, the more surely might a wealthy and educated criminal rely

upon receiving a certain amount of quasi-professional protection.

The passage from the *medicinal* to the *poisonous* action of tartarized antimony is witnessed in the administration either of one large dose, or of a number of small doses, following each other at such intervals that there is no complete recovery from the effects of one before another begins to operate. The professional and popular idea of poisoning by this substance has been hitherto limited to the former case, *i. e.*, the administration of large doses; but in reality, the adoption of the latter plan, *i. e.*, the administration of small doses at intervals, is far more efficacious in bringing out the noxious action of this mineral.

We are indebted to Dr. Mayerhofer of Munich, for a knowledge of the effects produced on the healthy human body by the repeated administration of small doses of tartarized antimony. The experiments undertaken by this gentleman were performed with a purely scientific object, and not with a view to obtain results in support of a foregone conclusion. They are, therefore, the more valuable and trustworthy.[1] Dr. Mayerhofer being at the time in a good state of health, experimented on himself. He dissolved a grain of tartarized antimony in one hundred drops (minims) of distilled water, and took one minim daily, for five days, in a table-spoonful of water immediately before going to bed. He suffered from no marked symptoms of any kind.

Hence, the 1-20th of a grain in divided doses, over a period of five days, produced no effects.

[1] An account of these experiments will be found in an elaborate Prize Essay, published in Heller's 'Archiv für Physiologische und Pathologische Chemie und Mikroskopie,' &c., III Jahrgang, pp. 100, 227, and 321, 1846,—under the title of "Physiologische, pathologisch-anatomische und pathologisch-chemische Wirkungén der Antimonial präparate auf den gesunden menschlichen und thierischen Organismus von Dr. Carl J. C. Mayerhofer, Dr. der Medizin, &c., aus München." It will be perceived that this essay was published ten years before the Rugeley crimes were brought to light. The questions which led to its publication, were proposed by the University of Munich, in the year 1841, and was as follows: "Quinam sunt effectus Antimonialium præparatorum in animalia viva? anne resorptio et transgressus horum remediorum in sanguinem et organa comprobari potest? quænam mutatio mixtionis et compositionis et in remedio applicatio et in organismo efficitur?" It will be perceived that this tripartite question embraces all the important points connected with the medico-legal relations of antimony.

On the sixth day, he took one minim three times, *i. e.*, in three separate doses. His sleep was disturbed; there was a sense of fulness of the head on awaking, which soon disappeared; tongue dry and clammy; appetite unaffected.

On the seventh day, three mimims to a dose were taken thrice. There was a feeling of oppression in the region of the heart; greater fulness in the forehead; taste clammy; rest much disturbed.

On the eighth day, the same dose was taken. In addition to the above symptoms, there was a sense of oppression in the stomach after eating; constriction in the throat, with oppressed breathing; feeling of coldness and loss of power in the limbs; constipation for three days, with tenseness of the abdomen; sleep much disturbed.

On the ninth day, four minims were taken at each dose, making twelve in the whole. Symptoms showed themselves in a more aggravated form. There was heat, with a feeling of congestion in the head; great oppression in the heart; pulse small and irregular; oppression in the stomach; nausea, with a disposition to vomit; increased flow of saliva; two liquid stools; restlessness at night.

On the tenth day, the same doses were taken at the same intervals. Symptoms the same. There was eructation of bile; sense of weight in the stomach, nausea, retching; increased thirst; a sense of coldness extending from the spine over the whole body; pain in the abdomen, followed by two liquid stools; sleep much disturbed.

On the eleventh day the doses were repeated. Additional symptoms manifested themselves in the form of abundaut perspiration; pain in the region of the stomach and liver; two liquid stools, strongly coloured with bile.

On the twelfth day, he took in the morning six minims in a table-spoonful of water. In an hour afterwards, he suffered from great oppression or sinking in the heart; heat and uneasiness throughout the body; fulness of the head and nausea. After much retching, he vomited a ropy, watery mucus, which had a bitter taste and acid reaction. Traces of antimony were subsequently detected in this liquid. There was a bitter taste in the mouth, with loss of appetite and increased thirst. Antimony was not found in the urine passed at this period. Two

half-liquid stools of an intensely yellow colour were passed. Antimony in traces was detected therein.

An interval of two days was allowed to pass in consequence of the illness induced; and on the fourteenth day, sixteen minims were taken in four doses. The symptoms were much aggravated: tenderness of the abdomen; a strong desire to pass the stools, but without effect; sense of weight in the limbs; a general feeling of coldness throughout the body, with a universal feeling of illness; pulse quick and irregular; giddiness while lying in bed; restlessness at night, and a catarrhal feeling of the throat on the following morning. On the next day, two half liquid stools of a dark yellow colour were passed. In the first there was no antimony; but traces of the metal were found in the second. There was no antimony in the urine.

On the following day, eighteen minims were taken in three doses. After the second dose, the experimentalist felt very unwell: there was nausea, with a sense of sinking and pressure in the stomach; and after the third dose, constriction of the throat, amounting to a sense of choking; much retching, followed by vomiting of mucus coloured with bile; violent perspirations over the body, especially on the chest; much urine passed, and still later, two liquid mucous and bilious stools. The pulse was small and contracted, and there was great thirst. There was restlessness at night, and in the morning, fulness of the head, with a general feeling of illness. Neither the urine nor the stools, on this occasion, yielded traces of antimony. The vomited matters, however, consisting of water, mucus, and bile, were found to contain antimony.

Some weeks afterwards, when Dr. Mayerhofer had recovered from the effects produced by these small doses, he took at one dose, *one grain* dissolved in a fluid ounce of distilled water. In *ten minutes*, he perceived a feeling of oppression in the region of the heart, with oppressed breathing and nausea; in *fifteen minutes*, heaviness and fulness of the head; flow of watery saliva, hurried respiration, quick pulse, sinking feeling at the pit of the stomach; loss of sight and hearing, with complete relaxation of the muscles; in *thirty minutes*, oppressive illness; a feeling of coldness; paleness of the face; nausea, violent retching; choking sensation, with constriction of the

throat; and, under violent straining of the chest and abdomen, vomiting of a ropy mucus, followed by partly digested food, and an intensely coloured bilious liquid, of a bitter taste. During the vomiting, the skin was covered with copious perspiration. A large quantity of pale urine was voided, and after some hours, two half liquid stools were passed. After this, Dr. Mayerhofer felt completely depressed and exhausted. He fell asleep, and awoke in a copious perspiration.

The vomited matters contained tartarized antimony in solution, and gave strong indications of the presence of the metal. The other principal constituent was the colouring matter of the bile. The urine passed subsequently to the vomiting presented nothing abnormal; it contained no antimony. Even that which was passed at a later period, and on the following morning, yielded no trace of the metal. Antimony was, however, found in the mucous and bilious fæces which had been passed.

Dr. Mayerhofer does not appear to have carried his experiments on himself beyond this point.

Dr. Wetzler, of Augsburg,[1] having dissolved twelve grains of tartarized antimony in six ounces of water, took a tablespoonful (= 1 grain), every hour, from five o'clock in the morning until three o'clock in the afternoon. The pulse was slightly increased. In an hour and a half there was nausea with vomiting of a mucous liquid, but this ceased, and did not return; there was then abundant perspiration for twelve minutes. The tongue was dry, and of a brownish-yellow colour. In five hours, there was intense thirst. In seven hours, a complete loss of appetite, fulness of the head, heat of forehead, great depression, and a feeling of general illness. At three o'clock, he found he could take no more of the antimonial mixture. In a few days he recovered. A fortnight afterwards he repeated the experiment with like results, excepting that from a feeling of the greatest loathing, he could not take the antimonial solution beyond a period of seven hours from the commencement. After the lapse of fourteen days, the experiment was performed for a third time. The solution was taken for ten hours and a half; violent

[1] Kleïnert's Allg. Repertorium der gesamt. Deutsch-Mediz-Chirurgisch. Journalistik. Leipzig, 1827. 1 Heft. p. 61.

vomiting followed, and on this occasion the illness was more severe. Dr. Wetzler felt that he could not continue his experiments.

Dr. Jankowich, of Ofen,[1] wishing to determine for himself the action of tartarized antimony on the healthy body, took, on the 14th July, 1841, a dose of the following mixture every hour:—Tartarized antimony, twelve grains, dissolved in three drachms of distilled water; of Mucilage of Gum Acacia, and Opiate Syrup, each half an ounce. Dr. Jankowich took eight grains of the antimony in five doses, or about *one grain and a half* for a dose hourly, commencing at eleven o'clock in the morning. Shortly after the first dose, he suffered from giddiness and a feeling of illness; after the second dose, a shivering over the whole body, cold perspiration, nausea, and retching. After the third dose, a painful feeling in the pit of the stomach, vomiting of much mucus and bile; uneasiness in the bowels, but without pain or purging; excessive and constant perspiration; increased flow of saliva:—and thirst, which he was compelled to satisfy by taking small quantities of cold water. He suffered from such extreme depression and weakness that he had not the power to rise from his seat. The fourth dose was followed by a feeling of increased illness, vomiting and purging. After the fifth dose, such apathy and disgust were excited that he felt quite ready to die. The pulse was considerably reduced. Up to this time, he had not suffered from any burning heat, constriction in the throat, or severe pain in the stomach and bowels; but his repugnance to any more doses of the medicine was such, that he found it impossible to continue it. He took some broth, which, however, he speedily vomited; this was followed by a further action on the bowels, nausea, perspiration, and great depression, lasting until night. He slept calmly, and the next day the unpleasant symptoms had disappeared.

We have, therefore, in this interesting series of experiments, an illustration of the effects of comparatively small doses of tartarized antimony, taken at intervals, on the human body. In Dr. Mayerhofer's case, one grain was taken in

[1] Med. Jahrb. der österr Staat. v. Raimann, 1842, p. 49.

doses of hundredths over a period of fifteen days; then we have the effects produced by a grain at a single dose.[1] Dr. Wetzler's experiments illustrate the effects of a dose of ten grains, taken in hourly doses of a grain over a period of ten hours, and in this case the condition called "*tolerance*" appears to have been set up to a certain extent, as in the Contrastimulist use of the mineral. Dr. Jankowich's experiments show the effects produced by a total quantity of about eight grains, taken in five hours in hourly doses of one grain and a half. These experiments represent the effects of this mineral on *healthy* persons, the condition which generally presents itself in cases of poisoning demanding medico-legal inquiry. They are far more valuable than the accumulated results of experiments with this substance on rabbits which do not vomit, and on dogs which do not perspire; and they are therefore calculated to be a safer guide in the formation of medical opinions. Dr. Mayerhofer furnishes the following summary.

When *a grain* of tartarized antimony is taken by a healthy person in doses of 1-100th gradually raised, the symptoms which show themselves are, a feeling of oppression and weight in the pit of the stomach, nausea, weight and fulness in the head, uneasiness; relaxation of the limbs, especially of the thighs; pains in the joints; shivering, as in fever; secretion of a watery saliva; tongue coated with a clammy mucus; increased appetite and thirst, with inward heat; great weakness and depression; hence a disposition to sleep, with painful dreams; frequent, irregular full pulse; giddiness;

[1] The reader will not be surprised at the powerful effects obtained from so small a quantity of the medicine, or at the results produced by Dr. Billing from doses not exceeding the sixteenth part of a grain, when he considers other well-known facts in toxicology. The quantity of carbonate of lead which produces lead colic and paralysis in workmen in white lead factories is not appreciable. It is the result of long exposure to the accumulated effects of numerous minute doses, and is in fact a form of slow poisoning. The Orleans family, living at Claremont, were poisoned by lead in a most severe form by the use of water containing only one seventy-thousandth part of its weight, *i. e.*, about one grain of lead in a gallon. The whole of the lead extracted from five hundred gallons, and taken at one dose, would not have produced the same serious effects that followed from the minute quantities in which the metal must have been taken day by day. Thirteen out of thirty-eight persons suffered from lead-poisoning in a severe form, and all the evil effects had been produced before the source of the poison was even suspected.

eyes dull and heavy; increased mucous secretion in the throat, with painful swallowing. After a longer period: appetite diminished; stomach painful on pressure; breathing difficult; a sinking feeling in the region of the heart; coldness of the body and limbs, with a sense of extreme illness and depression. The abdomen is tense and painfully sensitive; the stools are at first normal; then become gradually irregular, liquid or solid, and in the meanwhile there is often constipation. The secretion of urine is gradually increased; the urine is for a long time clear and watery, and but little changed in chemical constitution.

In these small doses, tartarized antimony, according to Dr. Mayerhofer, acts chiefly upon the mucous membrane of the alimentary canal; and in this view his experience is in accordance with that of Dr. Billing. The doses prescribed by this physician have been larger, namely, the sixteenth part of a grain; but still these are small compared with ordinary medicinal doses. The effects on the brain and spinal marrow are secondary, and are probably owing to the absorption and diffusion of the poison.

If tartarized antimony be given in small but increasing doses for a longer period, the symptoms are developed in a higher degree. The uneasiness, nausea, and retching are increased, and vomiting follows; the stools are pasty, and diarrhœa, attended with thin bilious and mucous discharges, gradually sets in; the abdomen is at the same time distended and tense. The voidance of urine is more frequent and violent. The region of the stomach is tender and painful; that of the liver appears fuller, and is sensitive to the touch. There are griping pains in the bowels, with stiffness and pains in the lower limbs. The warmth of the skin is at first increased; there is itching or irritation with alternation of heat and cold. The appetite is suppressed, and when any substance is eaten there is nausea, with an immediate disposition to vomit. There is a sense of roughness or rawness in the throat, with painful swallowing; the tongue is covered with a dirty mucus, and there is clamminess of the mouth. The head feels full and heavy. At a still later period the fæces contain much mucus, and are frequently strongly coloured with bile. The blood gradually loses its fibrin, becomes

almost liquid, and dark coloured. It contains a greater proportion of fluid and saline matters, with traces of antimony. If the use of the substance be longer continued, there is slowness with loss of power in the heart and pulse; the breathing is difficult, the complexion dusky; there is complete depression of the vital powers, with great debility and emaciation; the legs become heavy and stiff, as if paralysed, and death may follow as a result of the noxious impression produced on the more important organs of the body. Small doses act more powerfully when dissolved, than when administered in the form of powder. In addition to the above symptoms, the vomiting, from which the patient suffers, is either attended or followed by distension of the abdomen, and flatulence; liquid bilious motions, with colicky pains, paleness and sunken appearance of the countenance; cold perspiration, giddiness, great prostration of strength, incapability on the part of the patient of raising himself to the erect position, disposition to rest and sleep, loss of strength, fulness and frequency of the pulse, faintings, in many cases a feeling of coldness, accompanied with heat or flushing of some parts of the body, *e. g.* the face. If there is a recovery from this condition, pain in the stomach is felt for a long time afterwards, and inflammation of the stomach to a greater or less extent is set up. After the vomiting, there remains for a longer or shorter period, an unwillingness to take food, and nausea in partaking of it. Among the other effects, the perspiration and the urinary secretion are observed to be greatly increased.

If the use of tartarized antimony be continued in increasing doses when the poison has been already carried into the blood, the secretory organs are more strongly stimulated, and absorption as well as secretion, especially of the serous liquids, is greatly augmented.

If vomiting does not take place after larger doses, the following symptoms of poisoning are observed: metallic taste, nausea, retching, and vomiting, by which a large quantity of bile is expelled; violent pain in the stomach, heat and burning sensation in this organ, sometimes with a sense of burning heat and contraction of the throat and gullet, rendering swallowing difficult or impossible. There are spasms in the muscles affecting the neck and jaw, leading to locked jaw;

severe pains in and flatulent distension of the abdomen, with frequent watery or liquid motions; faintness; small, contracted, frequent pulse; the skin cold and pale, cold and clammy perspiration, sometimes great heat of skin, difficulty of breathing, painful sobbing, giddiness, stupefaction, loss of consciousness, delirium, spasms of the arms and legs, with the most complete prostration of strength. Death appears to result from the impression produced on the nerves of motion, as well as on the nerves of the lungs and heart, leading either to asphyxia or paralysis.

The facts here recorded prove affirmatively that the action of tartarized antimony on the *healthy* human organism, when administered in small and gradually increased doses, is far more powerful than it is commonly supposed to be. It is easy to conceive that a very slight addition to the small quantities taken by Mayerhofer, Wetzler, and Jankowich, or even a persistence in the doses for a still longer period, would have destroyed the lives of these experimentalists. Had some of those writers who, on the occasion of the Rugeley poisonings, manifested so great a desire to prove that tartarized antimony was not a poison, and could not destroy life, showed only a reasonable confidence in their own theories, and had made themselves the subjects of experiment with the drug, instead of relying upon rabbits and dogs, much erroneous speculation would have been spared, and the public would not have had to lament over new differences of opinion among medical men on a question of fact affecting human life.[1]

Tolerance.—The medicinal or poisonous action of tartarized antimony appears to be subjected, in certain cases, to peculiarities which have erroneously led to the belief that the substance may be taken with impunity even in large doses. I have already alluded to the practice of Rasori, Tommasini, Laennec, and others, in prescribing tartarized antimony in large doses in certain forms of inflammatory disease. This practice has been quoted as furnishing proof that the substance is not a poison; and the somewhat illogical inference has

[1] The papers on the action of Antimonial Preparations, published in Heller's 'Archiv.' for 1846, were referred to in the last edition of my 'Medical Jurisprudence' (5th edition, 1854, page 120) as worthy of notice.

been drawn, that if large doses can be borne by patients in certain states of disease, similar, or even larger doses may be borne with impunity by persons in a state of *health!* Laennec, who carried out the *Italian* practice to a considerable extent in treating his patients, began with a dose of a grain every two hours, until six doses had been taken. The medicine was dissolved in a large quantity of liquid, so as to prevent any local irritant action. The patient was then left to repose for seven or eight hours if the symptoms were not urgent, or if he experienced any inclination to sleep. In the more severe cases, he either gave the medicine uninterruptedly at the same interval, in the same doses, or he sometimes increased the dose to a grain and a half, two grains, and even to two grains and a half.[1] In the practice of M. Louis, from one to two grains were given at a dose, the whole quantity administered daily varying from six to twelve grains. M. Lepelletier, a writer of some repute, states that the dose best supported by adults is comprised between the quantity of six and twenty-four grains daily. Sir John Forbes, in commenting on this practice, gives as the result of his experience, that the doses safely adapted to this mode of treatment range from one to two grains, administered every two or three hours. The period over which such doses might be given was from one to nine days. Dr. Marryatt, of Bristol, who appears to have been the first to promulgate this mode of treatment (subsequently called Rasorian), recommended similar doses.[2] This physician had used tartarized antimony on a large scale; it was his chief remedy in the treatment of disease. His object in using it, like that of Rasori and others, was the very reverse of poisoning, *i. e.*, to endeavour to produce an effect on the body wholly exclusive of any sensible evacuation. He says, "I have seen many instances wherein a paper has been given every three hours, of which there have been ten grains of tartar emetic in six powders (about one grain and a half to a dose), without the least sensible operation by sickness, stool, sweat, or urine," &c. He does not appear to have tried it on

[1] 'Laennec,' transl. by Forbes, 3me edition, 256.

[2] Marryatt's 'Treatise on Therapeutics,' was first published in 1758; it reached ts eighth edition in 1788.

the healthy; and the diseases in which he gave it as a medicine were chiefly cases of pleurisy and fever.

The essential feature of Rasori's practice consisted in regarding tartarized antimony as the principal, and generally speaking, the sole remedy in the treatment of diseases of the chest. Rasori first employed it about 1799 in the treatment of an epidemic fever which raged at Genoa. He subsequently prescribed it in other diseases, in very large doses, and with a view to an *effect on the system* and on the *disease*, entirely *independent of any evacuation whatever*. He called this operation of the drug contra-stimulant—the reverse of stimulant or depressant. It seems that he rarely commenced the treatment with a smaller quantity than twelve grains, to be taken in the course of the day, and he caused this dose to be repeated at night. When the pneumonia had already made some progress, he gave twenty grains, or even thirty grains, daily; and afterwards went on increasing the dose to one drachm (sixty grains), or even many drachms daily, *according to the morbid state.*

On the power of the human organism to support these large doses, to which the name of *tolerance* (tolleranza) has been given, Rasori thus expresses himself:—"The fitness of the living organism to support large doses of the salt *without producing vomiting, or any other symptom of powerful action on the intestinal tube*, belongs only to the *morbid state*, is *limited to this*, and *lasts only so long as this*. The general morbid state designated by the word diathesis, is that which, in all cases, constitutes the fitness of the living body to *support with impunity*, or to express it more correctly, *with utility*, the different doses of the medicine." He especially enforces the doctrine, that where the disease diminishes or changes its character, the aptitude to support strong doses of this substance is also diminished or changed. There will be repugnance to the remedy, or nausea and vomitings, and a manifestation of what may be called excessive (or a poisonous) action of the medicine.[1]

[1] 'Bibliothèque Thérapeutique,' tom. i, p. 196. See also 'Della nuova Dottrina Italiana. Prolusione,' del Prof. Giacomo Tommasini, Firenze, 1817. As I have reason to know that there was an intention to misrepresent and misapply the principles of this Italian doctrine, for the purposes of the defence of William Palmer, had

It was observed in the practice of Laennec, that when tartarized antimony was given (to the diseased) in the doses already described, vomiting ordinarily followed the first, and generally the second dose, the bowels being sometimes simultaneously affected, and sometimes not, while the two or three doses next ensuing produced purging. After this, the alimentary canal, in cases favorable for this plan of treatment, became *tolerant* of the medicine, and no evacuation was produced. So far indeed from purging being a uniform effect, it was often necessary to suspend the employment of the antimony, and to administer clysters or purgative medicines. Some patients were observed to bear the medicine at once, and there was no vomiting or purging. In general, the remedial power of tartarized antimony was most rapidly manifested in those cases in which it gave rise to no evacuation. In one instance, a man took six grains daily, for two days; tolerance was established on the second day, and the symptoms of pneumonia disappeared. In another, twenty grains were prescribed in the twenty-four hours, and by a mistake, *forty grains* were taken. It occasioned but little evacuation, and the patient was benefited. In a third, the first dose of the medicine having increased a diarrhœa under which the patient laboured,

he been tried on the charge of murdering his wife, it may be as well to place on record here, for guidance in future cases, the *ipsissima verba* of the eminent pupil of Rasori, Giacomo Tommasini, of whose views and practice I had personal experience, during a residence in Italy, in 1828-9. Neither Rasori, nor his pupil, entertained the remotest idea that their 'nuova dottrina' would be perverted by medical men in England to a justification and excuse for secretly poisoning healthy persons by tartarized antimony. Contrasting the effects produced on the body by this drug, in a state of health and disease, Tommasini expressly says: "Mentre gl' indicati controstimoli l' ipecacuanha, per esempio, *il tartaro emetico*, gli acidi ed il nitro, non riscaldano, e non aumentano mai l' eccitamento in un corpo *sano, prima di gettarlo nella debolezza, ma i fenomeni di debolezza per primo ed immediato effetto producono.*" (Op. cit p. 65.) Here it it clearly implied, that doses which may benefit the diseased may injure the healthy. Again: "Le guarigioni (ottenute nell Ospedale de Milano dall' inventore di questa Dottrina), di tante inflammazioni di petto *col tartaro stibiato a dose generosa e senza corrispondenti evacuazioni*, quelle di simili ed altre malattie parinente flogistiche, per mezzo di digitale purpurea e quelle di tante dissenterie parimente flogistiche sotto uso della gomma gulta: *diminuendosi e sospendendosi per questo rimedio lungi dall aumentarsi gli scarichi*, sono fatti che non ammettono alcuno dubbio," p. 66. The conditions, therefore, which constitute the *poisonous* action of this drug, are those which do not occur, and cannot occur, without danger under this mode of treatment.

and the evacuations having occasioned syncope, it was suspended after two or three grains had been given. If the medicine had been persisted in, in spite of this warning, there is no doubt that the patient would have been poisoned by it. When tolerance was established, it was found that it might be given with safety, but only *so long as the tolerance lasted.*

Rasori attributed this tolerance to what he termed the diathesis, in other words, the peculiar morbid state or inflammatory condition of the system. Laennec ascribed it to the largeness of the dose, considering that a large, is less emetic than a small dose, to habit and the agreeableness of the vehicle (infusion of orange leaves) in which it was administered, as well as the intervention of two hours between the doses. Whatever theory we may adopt respecting the cause, the fact itself is undisputed, that in these inflammatory states of the system, larger doses have been borne than in a state of health :— the poisonous action of the drug appears to be suspended, and effects are produced quite different from those which are observed in the healthy. Sir John Forbes has very justly remarked, that the view of Rasori regarding the cause of this tolerance is probably correct; for, beyond all question, an inflammatory condition of the system renders it capable of supporting agencies, *e. g.*, the free use of cathartics, bleeding, and cold, which in health would be highly prejudicial. It is further a question with respect to the Rasorian treatment, whether imflammations, as they present themselves in Italy, are not less tractable, and whether they do not require remedies in more powerful doses than those which we are accustomed to prescribe in this country. It is quite certain that, although in the north of Europe, Rasori's treatment has been adopted by skilful practitioners, they have in no instance ventured to give tartarized antimony in the enormous doses which he has recommended.

According to Sir John Forbes, in Rasori's practice, out of 832 cases of pneumonia treated by him, 173 patients died, showing a mortality of 22 per cent. Rasori considered this to be very successful! Wagner, who witnessed the practice of Rasori at Milan, states that out of thirteen cases of pneumonia which he saw treated, seven were fatal, the deaths being caused, in his opinion, more by the practice than the disease.

Tommasini states, of his own practice, that out of 115 cases, 14 died, a mortality of between 12 and 13 per cent.[1]

Those physicians who have relied upon this practice, to show the non-poisonous action of the drug, have assumed that in all cases, its operation was beneficial and that it never caused serious symptoms or death! Laennec, it is stated, lost only two patients out of fifty-seven. M. Bouillaud, on the other hand, asserts that out of fifteen patients treated for pneumonia, by large doses of tartarized antimony, six died, showing a mortality of about 40 per cent.! The practice of Louis and Lepelletier, shows a mortality of about 14 to 15 per cent. How many of these died from actual poisoning by the medicine, we are not informed. The successful cases appear to be invariably set down to the "heroic" remedy, and the failures to the disease. Whenever tolerance is not established, the patient incurs a risk of life; and, according to the advocates of this mode of treatment, if tolerance cannot be established within a reasonable time, and before the powers of the patient are too much exhausted, the medicine should be withdrawn. In two cases, Laennec was obliged to discontinue the antimony, owing to his not being able to produce tolerance. In prescribing it for his patients, he was especially careful not to repeat the dose, if the preceding dose had occasioned any ill consequences. This of course obviated risk, and was, to a certain extent, a safeguard against the poisonous operation of the drug. In cases in which the evacuations were too copious, it was withdrawn.[2]

Sir John Forbes relates a case of affection of the heart with violent bronchial inflammation, in which there was at the same time tenderness at the pit of the stomach. Tartarized antimony was administered in large doses, with the effect, that not only was tolerance never established, but vomiting remained for some time after the antimony had been withdrawn. This was with difficulty subdued, and intense epigastric pain remained, until the case terminated fatally. On inspection, in addition to the indications of cardiac and bronchial affections, the mucous lining of the stomach was found in some parts quite pulpy, and almost every where intensely vascular

[1] Forbes' 'Translation of Laennec,' p. 264.

[2] Op. cit., pp. 258, 260, 262.

(reddened from inflammation).[1] Who can doubt from this description that the patient fell a victim to the Rasorian treatment; in other words, that he was poisoned by the remedy. Dr. George Wood, U. S., in remarking upon this antimonial plan of treatment, observes, "that it is not without its dangers. The depression may be too great—or gastro-intestinal inflammation may be induced, or the patient may be *exhausted by excessive vomiting and purging*. A patient who is placed under its use, should seldom be long unseen by the practitioner, as serious evils may happen in the intervals of his visits if long protracted. The plan is altogether unsuited to cases in which there is already gastro-intestinal irritation. Having witnessed fatal effects from the abuse of tartar emetic, I have been from the first averse to the plan, and the result of the few cases in which I have seen it employed, has not tended to reconcile me to it."[2]

It would appear that there are other diseases in which full doses of tartarized antimony may be borne, not only without symptoms of poisoning, but with benefit to the patient. Mr. Curling quotes a case of chronic traumatic tetanus, in which this medicine was given in doses of one grain every hour.[3] Large doses of tartarized antimony are also said to have been borne in cases of acute rheumatism, delirium tremens, and insanity (acute mania), without producing the usual symptoms of irritation amounting to poisoning.

According to Magendie persons affected with apoplexy, paralysis or mania, will bear large doses without injury. He relates the case of a patient, to whom he was called, who had been seized with sanguineous apoplexy. When he arrived, he found that twelve grains of tartarized antimony had already been administered to him without exciting vomiting. He then prescribed fresh doses until thirty-six grains had been taken in an hour and a-half. This was followed only by slight vomiting. The case ended favorably. The large quantity of tartarized antimony administered did not appear to produce any injurious effects.[4]

[1] Translation of Laennec, 3d edition, p. 423.

[2] 'Practice of Medicine. Special Pathology. Pneumonia,' vol. ii, p. 47. Philadelphia, 1847.

[3] 'A Treatise on Tetanus,' p. 179.

[4] 'De l'Influence de l'Emetique sur l'Homme.'

On the other hand, Orfila reports a case which shows that, although a state of apoplexy may give rise to such a tolerance of this compound, as to prevent the appearance of the ordinary symptoms of irritation during life, it will not prevent its action as an irritant, so far as appearances in the dead body are concerned. A man was seized with apoplexy on the 24th February, and died on the 1st March. During the five days of his illness, there were administered to him thirty-seven grains of tartarized antimony in divided doses. There was neither nausea nor vomiting, and only slight purging. After death, there was found considerable disease of the brain with serous effusion, and these morbid changes were doubtless the cause of death; but the intestinal canal presented appearances which could be ascribed only to the irritative action of the antimony. The stomach was much reddened, inflamed, and filled with biliary and mucous matters. The inflammation of the mucous membrane was in spots or patches—of a deep cherry red, or a violet rose-coloured ground. There was no ulceration. In the second and third curves of the duodenum, there were similar patches of redness on the mucous membrane. The small intestines were of a rose colour, and did not appear much inflamed. They contained mucous matters and bile. The cæcum presented three patches of a deep red colour. There were some on the colon but less red. The rectum was healthy. There were dark irregular patches in the lungs, extending into the substance of the organs.[1] Serious effects are occasionally produced by tartarized antimony, even when it appears to be tolerated in diseases of the lungs (see case No. 16, in the table at page 411.) In another case, a patient affected with pneumonia died while under treatment with large doses. An inspection showed that the medicine had produced serious mischief. The mouth, throat, and gullet, were covered with pustules. In a third instance in which ten grains dissolved in seven ounces of water, produced neither vomiting nor purging, the patient was attacked with severe angina. The mouth and lips were swollen, tongue red, dry in the middle, the fauces deeply reddened from inflammation, and covered with small bladders. These parts were coated with a tenacious mucus, so that swallowing was difficult.

[1] Case by J. Cloquet, 'Orfila Toxicologie,' i, 625.

Fever and delirium set in.[1] To the disordered condition of system thus induced by this medicine taken to excess, the term "*stibialism*" has been applied. There is reason to believe that many pneumonic patients have died from the antimonial treatment, while their deaths have been ascribed to the disease. M. Saurel, in admitting the benefits obtained from the medicine, deplores the serious accidents which ensue, and for which apparently no foresight can always provide. He relates two cases which fell under his own observation. In one, tartarized antimony was given in large doses; but while the pneumonia was benefited—the mouth was salivated—the papillæ of the tongue were enlarged, and converted to aphthous sores. They acquired a black appearance, and there was no doubt that the whole of the alimentary canal was affected in the same manner. The patient died in a month. He did not observe any indications of intolerance of the medicine. In a second case of pneumonia, the medicine was given in increasing doses—one grain and a half, two grains and a half, and then three grains; the whole quantity taken not exceeding *ten grains*. Retching appeared, and the antimonial mixture was withdrawn. A kind of catarrhal affection supervened,—a result of stibialism. This alone, however, would have been manageable. The death of the patient arose from intolerance in the alimentary canal; scarcely anything was retained. The whole of the mouth was covered with an aphthous eruption extending apparently throughout the alimentary canal. No treatment arrested its progress; and the patient died in about five weeks.[2]

M. Baudet considers that these serious effects on the mouth, throat, and alimentary canal, are owing to the medicine being taken in a *liquid* form. He recommends in preference that the antimony should be prescribed in the form of pills. Whatever view may be adopted on this point, there is no other term which can be applied to such effects than—*poisoning*. Stibialism is only another scientific expression of an esoteric kind.

[1] 'Med.-Zeit v. Heilk,' No. 41, 1839; also 'Heller's Archiv,' 1846, iii, p. 107. At page 110, is reported another case in which ten grains given in thirty-six hours, caused a purulent eruption on the back and arms, like that caused by local application of the ointment.

[2] Bouchardat, 'Annuaire de Thérapeutique,' 1856, p. 110.

Dr. Brinton, of King's College, has added his testimony to the noxious action of tartarized antimony, in cases in which it has been prescribed medicinally for the treatment of pneumonia. He has made special reference to one, a strong man suffering from pneumonia involving less than one sixth of the lungs. The drug had been prescribed, and had caused continuous vomiting for a week. The patient was in a hopeless state when first seen by him; the symptoms were those of a failure of circulation (his muscular strength being much less affected), a cold clammy perspiring skin, blue lips, and peculiar mental depression and anxiety. The instant and frequent administration of stimuli in large quantities, did not prevent his continuing to sink, and he died in about four hours. In two or three other cases of a similar kind, but not fatal, he had seen a peculiar eruption of the skin, like that produced by the external application of the poison,[1] although it had been given internally. From this accumulated evidence on the Italian mode of treatment, I quite concur in the opinion expressed by my friend Dr. John Webster,[2] that "the practice is frequently followed by very decided results." The results, however, are not always favorable, and the patient is poisoned *secundum artem!*

Let it not be supposed that by these remarks I wish to undervalue a mode of treatment for pneumonia, which certainly has the sanction of high medical authority; but when the successful cases of "tolerance" are brought forward for the purpose of proving that the practitioner is dealing with a perfectly safe and innocent drug; and the numerous cases in which this "heroic" treatment has either proved directly fatal or accelerated death, are either ignored or kept in the background—it is necessary to the interests of science and justice that the truth should appear. Assuming that cases of pneumonia will hereafter be treated as they have been on Rasorian principles, it is only proper that those of the public who are not suffering from pneumonia, should be protected from the possible consequences of large and frequent doses of this drug secretly administered. At present, the conclusion drawn by the advocates of the theory and practice, is, that the healthy

[1] Med. Soc. of London, 'Lancet,' May 31st, 1856, p. 590.

[2] 'Lancet,' January 26th, 1856, p. 107.

ought not to die from its effects, because the diseased have been in many instances cured by it without bleeding, &c. Let those who believe this doctrine submit themselves to experiments as a test of their sincerity, and follow the example of Mayerhofer in recording their experience for the benefit of society.

The tolerance of this medicine may be more apparent than real. The ordinary effects may be replaced by some other noxious mode of operation. Dr. Male states that he was called to a child to whom a large dose had been given, and no vomiting had taken place. The child lay in a state of insensibility, the extremities were cold ; the pulse languid and almost imperceptible. On administering strong brandy and water, violent vomiting succeeded, and the child recovered.[1]

Orfila on one occasion prescribed three quarters of a grain for a child ten years of age with a view to act as an emetic. Vomiting did not take place, but in half an hour there was severe pain in the throat, with great difficulty of swallowing. There was no pain. These symptoms lasted more than two hours.[2]

A case of pneumonia is reported by Dr. Haldane, in which tartarized antimony was given in divided doses, until the quantity amounted to forty or fifty grains. The man then complained of severe sore throat. He died of pneumonia in four days—the lung was found diseased. Aphthous ulceration was found in the mucous membrane of the pharynx and larynx including the epiglottis. There could be no doubt that this had been caused by the antimony.[3] Three cases of pneumonia in which it proved fatal, by leading to hæmorrhage from the nose and the bowels, are reported by Dr. Peebles, U. S.[4]

Cramp in the stomach and gastritis have been frequently observed to result from the free use of tartarized antimony in the treatment of the autumnal fevers of the United States. In the opinion of Dr. Drake it is a frequent cause of death.[5]

Dr. B. W. Richardson states that he prescribed for a delicate strumous man, suffering from pneumonia and pleuritis, one third of a grain of tartarized antimony, to be taken every

[1] 'Juridical Medicine,' p. 96.
[2] Orfila 'Toxicologie,' vol. i, 621.
[3] 'Edinburgh Monthly Journal,' August, 1854, p. 184.
[4] 'American Journal of Medical Science,' April, 1848, p. 339.
[5] Beck's 'Medical Jurisprudence,' vol. ii, p. 603.

four hours. In half an hour after he had taken the first dose he suddenly became restless, cold, and faint; he then vomited, and soon afterwards was violently purged. In three hours, although the pain at the chest had disappeared, the vomiting, purging, and prostration were extreme. There was little pulse, the surface was cold; the legs were cramped. The case was similar to one of Asiatic cholera, and was evidently a case of poisoning by antimony. It was found that, owing to an accident in dispensing, *three grains* of tartarized antimony had been taken by the patient. On another occasion he prescribed for a stout, active, well-built man, fifteen minims of antimonial wine (= 1-16th of a grain of tartarized antimony). This small dose was prescribed as the patient had informed him that he suffered severely from the effects of antimony. It produced incessant nausea for many hours. There was abdominal pain with griping, faintness, general exhaustion, and great prostration of strength. There was no purging.[1]

The result of this investigation is, that there appear to be certain diseased states of the body which modify or suspend that excessive action of tartarized antimony on the system to which the term "poisoning" is applied: that great precautions are required in its use, even in these cases, or it may destroy life; that large and repeated doses have been frequently taken by patients without causing symptoms of poisoning, and with actual benefit; but there are no facts to justify the inference that this substance is not a poison to the healthy, or to those persons who labour under any disease in which tolerance is not speedily established. The healthy and the diseased will die alike from its effects, if the symptoms indicative of poisoning (vomiting, purging, pain, and depression), are once established, and not afterwards suspended, either by the withdrawal, or in certain cases by the continued administration of the medicine.

The facts have hitherto presented no difficulty to medical jurists except in their perversion. The late Professor Orfila pointed out, in the last edition of his work, the fallacy into which some medical writers have fallen in describing the properties of tartarized antimony. In referring to the influence of dose on the poisonous action of various substances, he says: "Persons labouring under certain forms of disease will bear without

[1] 'Lancet,' April 12th, 1856, p. 400.

injury considerable doses of a poisonous substance, while much smaller doses would produce dangerous effects on the same persons in a normal (healthy) state. We may quote in proof of this, the effects of tartarized antimony in inflammation of the lungs. Would any one take it into his head to assert that these poisonous substances are not deleterious to man, because they do not act as poisons even in very large doses? Assuredly not, the fact would merely prove that those substances which are poisonous in the generality of cases, are not poisonous in the same doses under certain conditions in which they are tolerated."[1]

It is strange that so soon as a vital necessity arose for acknowledging this scientific truth, it was wholly ignored, even by writers of a respectable professional position. At the same time they would admit that persons suffering from tetanus or hydrophobia have taken with impunity doses of opium which would have infallibly destroyed them, if they had not been labouring under these diseases. Is it to be said that opium is not a poison, and that a few grains of this drug will not destroy the life of a healthy adult, because larger doses have been given without dangerous consequences to the hydrophobic or tetanic patient? Yet either this must be the extent of the argument, or it amounts to nothing with respect to the variable action of tartarized antimony on the body. In the mean time, the promulgation of such illogical views, when the attention of the public was specially directed to the subject of poisoning, and a trial was pending in which the criminal use of tartarized antimony was the main question at issue, has had the evil effect of causing that crime to be imitated, and has led to the perpetration of at least two murders! It would have been an honorable course for those who entertained reasonable doubts on the poisonous action of this drug, to have presented themselves as witnesses in the case, and have tendered the evidence of their experience; but it was most injurious to the profession and public to disseminate imperfect views, which could only have the effect of misleading lawyers and the class of men who constitute juries, on the question which was then about to be tried.

[1] 'Traité de Toxicologie,' tome i, p. 13, 5ème ed., 1852.

3. Action of Tartarized Antimony in large doses as a poison. Acute poisoning.

It has been remarked by most writers on toxicology, that cases of poisoning by tartarized antimony are not common. In 1837-8, out of 527 deaths from poison, in which the poison taken was ascertained, there were only two deaths which had been caused by this substance. In France, out of ninety-four recorded deaths from poison, (1825—32), there was only one from tartarized antimony. Out of 213 cases of poisoning admitted into the London Hospital during eleven years, 1846—1856, there was, according to Mr. Burch, only one in which tartarized antimony was the poison used (in 1846), and in this instance the patient recovered. In twenty-seven cases of poisoning admitted into Guy's Hospital in three years, 1854—6, there was not a single instance. During a period of twenty-six years, the number of cases referred to me as actual or suspected poisoning by tartarized antimony, in which this substance had been administered, have amounted to only nine, of which two proved fatal. Five of these cases, including the two which were fatal, have occurred since 1855. The infrequency of cases of poisoning by this substance has been erroneously supposed to indicate that it is not poisonous, and that the free use of it is not attended with danger. The same mode of reasoning would prove that strychnia, atropia, and aconitina were not poisonous. When a substance is rarely taken or administered as a poison, the number of fatal cases must necessarily be few. Although, for reasons already stated, tartarized antimony is not so energetic and certain a poison as arsenic, yet if it were taken or administered as frequently, cases of its fatal operation would be far more common. In medical practice, care is invariably taken that its medicinal, does not pass into its poisonous action; and the doses are either reduced, given at longer intervals, or altogether withdrawn, when any injury to the patient's condition is manifested. Fortunately, sufficient warning is given of the probable danger before injurious effects are produced; and, in general, the rapid recovery of the patient when the medicine is suspended, forms a striking contrast with the effects of arsenic under similar circumstances.

We are indebted to Magendie for our knowledge of the earliest cases of poisoning by large doses of tartarized antimony.[1]

1. A man, æt. 50, swallowed eighteen grains in a glass of water. He was brought to the hospital of St. Louis; mucilaginous drinks were freely prescribed, and he recovered in two days.

2. A woman, æt. 26, swallowed twenty-four grains in a glass of water. She suffered from painful purging and vomiting of mucous matters mixed with blood; severe pain in the epigastrium, and some convulsive movements. Under treatment with gum water, &c., she recovered.

3. A stout woman, æt. 40, took thirty-two grains in cold water. She had repeated vomitings, which gradually subsided. On the next day, she merely complained of uneasiness of the stomach.

4. Breschet met with a case in which a woman swallowed sixty grains in the pulp of an apple. She was immediately taken to the hospital of St. Antoine. She rejected, by vomiting, the pulp, in which there was a visible quantity of tartarized antimony, and she recovered.

5. A man swallowed by mistake, *twenty grains* of tartar emetic, in a decoction. In a few minutes, there was pain in the region of the stomach, which increased in severity, and was followed by fainting. There was then excessive vomiting of a bilious liquid; and when the patient was first seen by Magendie, these fits of vomiting succeeded each other with frightful rapidity. There were severe colicky pains in the abdomen; incessant purging, the stools being liquid and copious. The pulse was small and contracted; the face pale; there was great prostration of strength, and painful cramps in the legs, a symptom of which the patient complained most. A demulcent treatment was adopted with benefit. In the evening, the patient complained only of weakness. The irritation produced by this large dose on the mucous surface of the stomach and bowels, gave rise to symptoms resembling those of cholera morbus. They continued for a period of five or six hours, and then subsided under treatment.

6. A young woman swallowed thirty grains. She was soon

[1] 'De l'Influence de l'Emétique sur l'Homme et les Animaux,' 1813.

attacked with violent vomiting, which continued until the evening, in spite of the administration of infusion of Peruvian bark. With the exception of a feeling of weakness, she recovered on the following day.

7. A man swallowed twenty-seven grains in sugared water. He had hardly gone twenty paces, when he felt a burning heat in the stomach, accompanied by loss of consciousness and convulsive movements. In ten minutes after he had swallowed the poison, he was brought to the Hotel Dieu. The symptoms from which he was then suffering were: cold and clammy state of skin from head to feet; respiration short; pulse small and contracted, and the region of the stomach swollen and painful; there was at this time hiccough, but no vomiting. In two hours, there was copious purging and sweating, followed by vomiting, which continued the next day. An attack of inflammation of the stomach supervened, which lasted several days. A month afterwards, he still suffered from pain in the pit of the stomach.

8. A girl swallowed six drachms (about 360 grains) of tartarized antimony. M. Lebreton, who saw her half an hour afterwards, administered to her a large quantity of oil. She vomited immediately, and probably brought up the whole of the poison, for the vomiting and other symptoms soon ceased.

Magendie refers to some cases among his patients in which ordinary grain doses of this substance did not cause vomiting, although other symptoms of a severe kind were manifested, *e. g.*, pains in the chest and abdomen, and convulsions, with great prostration of strength. In one instance the patient took several large doses in succession, until the whole quantity taken had amounted to *twenty-two grains;* there was no vomiting, but other symptoms of a vicarious kind appeared, *i. e.*, profuse evacuations of glairy, mucous, and bilious stools, with constant straining (tenesmus). This patient did not recover from the effects for three years.[1]

It is quite clear from these, and similar facts recorded by others, that there are some cases of poisoning by this substance in which vomiting is absent; but its absence is com-

[1] Op. cit., pp. 25, 26.

pensated by other symptoms of a violent and depressing kind.

The conclusions drawn by Magendie from his researches were—

1. That tartarized antimony in a large dose may give rise to alarming accidents and even death; and if in certain cases large doses have been swallowed without serious effects, this is owing to the rejection of the substance by vomiting, or in the evacuations.
2. That its deleterious action is specially manifested on the pulmonary tissue, and on the mucous membrane of the alimentary canal from the stomach to the rectum.
3. That when it causes death, this effect cannot be ascribed to the local action of the substance on the organs, but to its absorption and diffusion through the whole circulation.

Cuvier, in reporting on Magendie's researches, observes, it is fortunate that the first effect of this substance is to produce vomiting, and thus the dangerous symptoms, and even death, likely to be caused by it, are counteracted by its own operation, when taken in large doses. He further remarks: the duration and copiousness of the evacuations, as well as the intensity of the symptoms, depend less on the dose of tartarized antimony than on the constitution or idiosyncrasy of the person to this particular drug. This is a point of which a medical jurist should not lose sight, as it serves to explain many anomalies in its effects in relation to the dose taken.

With these plainly expressed views, it is surprising that some medical writers should have quoted Magendie as an authority for the statement that tartarized antimony is *not a poison!* Magendie states that he has not met with a fatal case; but in this respect he is not singular, for there are many physicians in extensive practice who have probably not seen a fatal case of poisoning by tartarized antimony, strychnia, or even arsenic. On the other hand, he has known persons to recover after having taken large doses of tartarized antimony, and there are recorded many cases of poisoning by arsenic and opium, in which persons have equally recovered after having taken very large doses of these poisons. With

respect to fatal cases of poisoning by tartarized antimony, so far from denying their occurrence, he expressly says: "Il se pourrait donc que des cas de cette espèce se fussent rencontrés, les expériences que j'ai rapportées me paroissent rendre la chose probable. * * * La conséquence générale qu'on peut déduire de tout ce que j'ai dit, est qu'on pourroit le prévoir par le simple raisonnement, savoir qu'un homme ou un animal pourra prendre sans danger une dose très forte d'émetique, *pourvu qu'il vomisse promptement après l'avoir prise; et qu'en vomissant, il rejette* à très peu près *le sel* qu'il avoit avalé. Dans le cas contraire, c'est à dire, si l'homme ou l'animal qui a pris l'émetique en grand quantité, ne vomit point, ou vomit sans rejeter la plus grande partie de l'émetique qu'il a avalé, il pourra en résulter *des accidens graves* et *la mort*. Dans ce dernier cas, ou aurait encore un semblable resultat, quand bien même la quantité d'émetique *ne seroit point très considérable.*" The facts observed and recorded by Magendie admitted of no other conclusion than that which he has here drawn. The cases related under 5, 6, and 7, are clear cases of poisoning by this substance. In Case 5, only twenty grains were taken, and the effects were such as might have caused death in persons naturally feeble or weakened by disease. That other persons have taken, without much suffering, the same, or even larger doses, does not affect the question whether the substance be a *poison or not*. Ten negative results cannot affect one clearly established affirmative instance. But these negative results were here observed in cases in which there had been early and judicious treatment, with free and copious evacuations, either by vomiting or purging, or by purging alone. Had Magendie continued to dose his patients with antimony, instead of relieving them by proper medical treatment, it is easy to comprehend that the greater number, if not all, would have died. As it is, the facts show that which experience has since confirmed, that there is a better chance of recovery under treatment in antimonial poisoning than in some other forms of mineral poisoning in which the substance is not so readily expelled from the body.[1]

[1] I have here placed these facts on record that the real views and conclusions of Magendie may be known. At the time of the Palmer trials, these views were grossly misrepresented in various publications, in order to make it appear that the witnesses

In the subjoined table I have collected and arranged those cases of poisoning by tartarized antimony which I have been able to collect from authentic sources. Assuming that the deaths among healthy persons are few compared with the number of cases, it must be remembered that this is the general character of poisoning. There are some poisons from which the recoveries are proportionately few, such as prussic acid; but taking a large number of cases of poisoning indiscriminately, the recoveries bear a large proportion to the cases when these are submitted to early treatment. Out of 213 cases of poisoning recorded by Mr. Burch, as received at the London Hospital during eleven years, there were only fifteen which proved fatal, a ratio of 7 per cent., or ninety-three recoveries to seven deaths. Among sixty-three cases of poisoning treated at the Birmingham Hospital in eight years (1848—56), reported by Mr. W. Wilson, there were only five deaths, a mortality of less than 8 per cent. Of twenty-seven cases admitted into Guy's Hospital in three years, there were eleven deaths, showing a larger proportionate mortality, *i. e.*, about 40 per cent. These results will of course be influenced by the nature of the poison and the stage at which the case comes under treatment. If we take an individual poison, such as opium (laudanum), we shall find that, as in tartarized antimony, the recoveries bear a very large proportion to the deaths. Out of sixty-one cases of poisoning by laudanum reported by Mr. Burch, there were only four deaths; and of the five cases of this kind of poisoning reported in the Guy's return, all recovered. The fact, then, that recoveries are numerous, and deaths are proportionately few, must not be allowed to influence our judgment on the question whether a particular substance is or is not to be regarded as a poison.

for the Crown were mistaken. It was even asserted that Magendie himself had been summoned as a witness for the defence of William Palmer, although it was well known to the scientific world that he had been dead many years! Could his evidence have been procured, the relation of the symptoms in Case 5 would have completely corroborated the conclusions drawn by the witnesses for the Crown regarding the effects of antimony.

Cases of Poisoning by Tartarized Antimony.

No.	Authority and date of occurrence.	Dose taken and symptoms observed.	Result.—Appearances after death.
1	Magendie, 'De l'Influence de l'Emétique sur l'homme et les Animaux,' Paris, 1813. A man, æt. 50.	Eighteen grains in a glass of water. Treatment in hospital.	Recovery in two days.
2	Ibid. A woman, æt. 26.	Twenty-four grains in water. Painful purging and vomiting of mucous matters, mixed with blood; severe pain in abdomen; convulsive movements. Treatment in hospital.	Recovery.
3	Ibid. A woman, æt. 40.	Thirty-two grains in water. Repeated vomitings, gradually subsiding; uneasiness of stomach the day following.	Recovery.
4	Ibid. (Breschet.) A female.	Sixty grains in pulp of apple. Immediate treatment. Pulp with the poison rejected by vomiting.	Recovery.
5	Ibid. A male. (Dr. Barbier, Amiens.) Orfila, op. cit., i, 622.	Twenty grains in a decoction. In few minutes severe pain in stomach; fainting; incessant vomiting of bilious liquid and incessant purging; liquid stools; cramp in legs; pulse small and contracted; great prostration of strength. Treatment.	Abatement after five or six hours, and recovery. Great weakness and disordered digestion remained.
6	Ibid. A female.	Thirty grains. Speedy and violent vomiting, continuing the whole of the day in spite of treatment.	Recovery next day. A feeling of weakness.
7	Ibid. A man, æt. 43. (Dr. Serres.) Orfila, 'Toxicologie,' i, 622.	Twenty-seven grains in water. In a few minutes burning heat of stomach; loss of consciousness; convulsive movements. In ten minutes skin cold and clammy; *no vomiting;* stomach swollen and painful; breathing short; pulse small and contracted. In two hours, copious purging and sweating, followed by vomiting. Gastritis of several days' duration. Treatment.	Recovery; but for a month after taking the poison, suffered from pain at the pit of the stomach.

No.	Authority and date of occurrence.	Dose taken and symptoms observed.	Result.—Appearances after death.
8	Magendie, 'De l'Influence de l'Emétique sur l'homme et les Animaux, Paris, 1813. (Lebreton.) A girl. Orfila, 'Toxicologie,' i, 620.	Six drachms (360 grains). Oil speedily administered. Vomiting; poison ejected.	Recovery.
9	Dr. Carron, 'Journal Générale de Médecine,' 1811. Orfila, op. cit., i, 620. A man, æt. 30.	A large dose. Speedy and violent vomiting; severe pain in stomach; after some hours difficulty of swallowing; almost complete obstruction of gullet; spasm of muscles of neck; face red and congested; eyes suffused; giddiness. These symptoms lasted thirty-six hours. Treatment.	Recovery—spasm of the gullet occasionally presenting itself.
10	Ibid. (Dr. Carron.) A female.	Seventeen grains. Severe pain; incessant vomiting; spasmodic closure of the jaws; convulsions. Symptoms removed by treatment.	Recovery; but an irritability of stomach remained, only relieved by milk and mucilaginous drinks.
11	'Journal Générale de Médecine,' Mai, 1825. Orfila, 'Toxicologie,' i, 623. A female, æt. 23. (Dr. Sauveton.)	Fifty-four grains in solution. In ten minutes, found covered with a cold sweat. Symptoms imperfectly described. Nausea and colicky pains in the pit of stomach.	Recovery; but pain in pit of stomach for some months.
12	Orfila, 'Toxicologie,' i, 623. (Dr. Recamier.) A man, æt. 50, of strong constitution.	Thirty-six grains in a small quantity of liquid. Speedy vomiting; violent purging and convulsions; violent pain in abdomen, which was distended; pulse imperceptible; delirium and convulsions.	Death on the fourth day. Inflamed state of cerebral membranes, with serous effusion: brain soft. Mucous membrane of stomach swollen, reddened and softened, except at the greater end; of the duodenum, also reddened; intestines empty.
13	'Gazette Médicale,' Dec. 18, 1841. (Dr. Sacli.) Orfila, 'Toxicologie,' i, 624. A man, æt. 40.	Six grains and a quarter in four ounces of water. No vomiting although warm water freely taken. After some hours, uneasiness; nausea; heat in pit of stomach; restlessness; giddiness; fainting. In eight hours, loss of consciousness; convulsions; difficulty of breathing; livid face; pulse slow and full. Treatment.	Recovery in two days, with slight pain in stomach, heaviness of the head, weakness in limbs, and disturbance of speech.

14	Casper's 'Wochenschrift. (Dr. Lambert.) 'Med. Jurisprudence,' 5th ed., p. 118. A man.	Four grains. Violent pain in abdomen; vomiting and purging, followed by strong convulsions, lasting half an hour; loss of speech; pulse imperceptible; cold skin, and collapse. Treatment.	Recovery in fourteen days.
15	Orfila, 'Toxicologie,' i, 625. (Cloquet.) See ante, page 397. A man.	Thirty-seven grains, in divided doses, in five days. No vomiting, only slight purging.	Death in five days, from disease of brain. Stomach, duodenum, and cæcum inflamed in spots or patches. Dark patches on the lungs.
16	'Gazette Médicale,' 1839, No. 2. Heller's 'Archiv,' iii, 1846, p. 105. A man, æt. 66.	Sixty grains in four days, for pneumonia. On third day symptoms much aggravated; breathing rapid; pulse 106; restlessness and great anxiety; membranous exudation in the mouth.	Death. Mouth, throat, and gullet covered with false membranes; in the latter, ulcerated pustules, as far as opening of stomach; mucous membrane of stomach covered with mucus; dotted redness in great curvature; mucous glands of small intestines enlarged; lungs partly hepatized, and infiltrated with pus.
17	Heller's 'Archiv.,' iii, 1846, p. 108. (Mayerhofer.) A woman, æt. 33.	Six grains, wrapped in paper. In half an hour, severe and painful vomiting of mucus, mixed with bile and some blood. The next day a red tongue; intense thirst, and heaviness of the head.	Recovery.
18	Ibid., p. 109. (Prof. Giacomini.) 1833-8.	Twenty grains in solution. In ten minutes trembling of the knees; giddiness and shiverings of the body; insensibility for half an hour; forehead and hands covered with cold sweat, which, when removed, speedily returned; face pale; lips livid; pulse scarcely perceptible, sometimes quick, at others slow; increased secretion of saliva and urine. On the next day there was purging.	Recovery.
19	Ibid., p. 111, 1842. (Consbruch.) A man.	Dose unknown. A concentrated solution of tartarized antimony.	Death in a few hours. In stomach, a thick, bloody mucus; mucous membrane intensely inflamed, corroded, and easily removed from muscular coat; the inner surface of duodenum in the same state; of the rest of intestines, greyish and softened; vessels of brain and lungs of right side of heart and the venous trunks, strongly congested.

No.	Authority and date of occurrence.	Dose taken and symptoms observed.	Result.—Appearances after death.
20	Kleinert's 'Repertorium v. Jahrg.,' 1831, 9 H., p. 16. Heller's 'Archiv.,' 1846, p. 107. (Dr. Driver.) A female, æt. 40.	Forty grains in two ounces of water, one half at one dose, of the rest a table-spoonful every quarter of an hour. Vomiting first set in an hour after the last dose; she then fell into a state of asphyxia, and when restored from this, she complained of severe pain in the body. There were several involuntary motions, with much mucus and dead worms. In twenty-four hours there were tetanic spasms affecting the legs.	Recovery.
21	'New York Med. Journ.' Beck's 'Med. Jur.,' ii, 603. (Dr. C. Lee.) A child, a few weeks old.	Fifteen grains in solution. Vomiting; purging; and convulsions.	Death. No report of appearances.
22	Wharton and Stille's 'Med. Jurisprudence,' p. 455. (Dr. M'Creery, U.S.N.) A man.	Half an ounce (240 grains). In half an hour, nausea, followed by distressing vomiting and purging, with violent cramps in legs and wrists. Treatment.	Recovery in a few days, but great prostration remained.
23	Ibid. Canstatt's 'Jahresbericht,' 1851, iv, p. 270. A woman.	Twenty grains. Strength reduced by its violent action.	Death in the course of a year, from irritant effects on intestinal canal.
24	Traill's 'Medical Jurisprudence,' 113. A man, æt. 24, in 1837.	Three drachms (180 grains). Symptoms not described.	Death.
25	Ibid. A child.	Dose not stated.	Death.
26	'London Medical Gazette,' vol. xlv, p, 801. (Dr. Pollock.) A man, æt. 30, Jan., 1849.	One drachm (60 grains). Early and violent vomiting; in two hours, retching at intervals; heat and constriction of throat; pain in stomach; breathing frequent; pulse rapid and small; skin perspiring; bowels moved twice. In seven hours, motionless; insensible; respiration slow; mouth spasmodically closed; surface warm and dry; pulse small, 130; no vomiting or purging; no power of swallowing. Treatment.	Death—tranquil, without convulsions—in ten hours after the poison had been swallowed. No inspection.[1]

[1] I have a note of another case in which fifty grains proved fatal in fifteen hours.

27	'Lancet,' May 22d, 1847. (Mr. Freer.) A man, æt. 28.	Two drachms[1] (120 grains). In half an hour, vomited once; involuntary aqueous purging; mustard and salt produced violent vomiting of bilious matter. In one hour, pulse imperceptible; countenance cold and livid, bathed with clammy perspiration; tongue dry and red; violent pain in stomach and over the whole abdomen. Cramps, vomiting, and aqueous purging continued for six hours. Profuse night perspirations.	Recovery.
28	'Western Journal Med. and Surgery.' 'Med. Times,' Jan. 24th, 1846, p. 127. (Dr. Gleaves.) A man.	A table-spoonful (478 grains). In an hour, speechless, pulseless, and apparently dying; vomited only two or three times in three hours. Violent purging in two hours. In seven hours this ceased; there was great thirst, with burning pain in throat, gullet, stomach, and bowels; vomiting the next day; matters tinged with blood; fauces covered with pustules. On third day, the whole body covered with genuine tartar emetic pustules; copious secretion of urine; pain in passing it.	Recovery, in about two weeks.
29	'Lancet,' April 25th, 1846, p. 460. (Mr. Hartley.) A boy, æt. 5.	Ten grains in powder, mixed with sugar. In twenty minutes, violent vomiting and purging, and great prostration of strength; great thirst; convulsions and tetanic spasms.	Death in eight hours. Effusion of serum in right pleura; redness of right lung; mucous membrane of stomach much inflamed at larger curvature and cardiac orifice; that of duodenum also. Stomach contained a dark, bloody, or brownish liquid; duodenum contained a whitish-yellow viscid secretion, found throughout intestines, but of a deeper yellow in large intestines; peritoneum of stomach and intestines inflamed; no ulceration; great congestion of brain and membranes, but no effusion of serum or blood.

[1] In a letter, Mr. Freer informs me that the quantity was half an ounce, or 240 grains.

No.	Authority and date of occurrence.	Dose taken and symptoms observed.	Result.—Appearances after death.
30	Ibid. (Mr. Hartley, 1846.) A girl, æt. 3.	Ten grains in powder, mixed with sugar. Symptoms similar to those observed in preceding case.	Death in thirteen hours. Appearances similar. Patches resembling scarlatina on skin of arms, leg, and neck. On mucous membrane of stomach, where inflammation was greatest, several white spots—the commencement of ulceration. No antimony found in stomach in either case.
31	'Lancet,' Jan. 21st, 1854. A girl, æt. 16.	From forty to sixty grains. Severe vomiting in a quarter of an hour, followed by purging, continuing three hours; pain; burning sensation in gullet. The next day symptoms abated; relapse in the afternoon; she threw her head back and screamed; skin warm and moist; pupils dilated; knees drawn up; delirium for six hours.	Death in thirty-six hours. Throat swollen; lungs congested; stomach contained a bloody fluid; coats softened; blood effused under mucous membrane; small intestines contained a similar fluid, with mucus. There was no inflammation. Lungs slightly congested; heart contained fluid blood. Only slight traces of antimony detected in contents of stomach.
32	'London Medical Gazette,' July 11, 1835, vol. xvi, p. 521. A child.	Fifteen grains (?), taken in the morning. In half an hour violent vomiting and purging; at 12 o'clock, skin cold, covered with clammy sweat; pulseless; rapidly sinking.	Death—at one o'clock—in six hours (?). Mucous membrane of stomach (posteriorly) dull, rosy appearance; gall-bladder full; mesenteric glands enlarged; effusion in left ventricle of brain; substance of brain soft. No antimony found in contents of stomach.
33	'Journal de Chimie.,' 1847, p. 472. (M. Charier.) An infant recovering from measles.	Three quarters of a grain, prescribed for some disorder of stomach.	Death in an hour.

34	Ibid. An infant, recovering from measles.	Three quarters of a grain, as a medicine.	Death.
35	Ibid. (M. Richelot.) A child, æt. 4, recovering from hooping-cough.	One third of a grain in solution prescribed. Vomiting five or six times, followed by fainting and severe collapse.	Recovery on withdrawal of the mixture.
36	Ibid. (M. Thirial.) An infant recovering from disease.	Dose not stated, followed by serious symptoms, which nearly caused death.[1]	Recovery on withdrawal of medicine. In eight days the cuticle fell from the hands.
37	Andral's 'Clinique Médicale,' Spillan, 1836, p. 698. A medical student, æt. 28.	Two grains (at four p.m.) in two half glasses of water, prescribed for gastric disturbance. In the night, profuse vomiting and purging; the next day, great depression; anxiety. On the second day, cold extremities, thready pulse; unconsciousness.	Death in forty-one hours. Infiltration of blood in spots in mucous membranes of stomach, close to cardia (petechiæ); mucous surface of large and small intestines pale; liver pale, structure friable; spleen enlarged and soft; kidneys reddish; brain and membrane reddish; reddish serum in ventricles; substance of brain soft; lungs gorged; heart contained liquid blood. Livid discoloration of skin of chest.

[1] The dangerous or rather *poisonous* effects produced by tartarized antimony on infants and children, have been pointed out by Mr. Goodlad, Mr. Noble, and Dr. J. B. Beck. Mr. Noble states, that among four cases in which ordinary doses were given, prostration and collapse followed, and two of the children died from the effects of the medicine (poison?). Dr. Beck remarks that the medicine should not be given to delicate children or to those of a scrofulous habit. The younger the subject, the more likely the medicine is to do harm;—in children under a year, as a general rule, it ought not to be used. During that period, the powers of life are too feeble to bear so active a remedy. Its tendency is to produce fatal collapse.—'London Medical Gazette,' vol. xl, p. 351.

The above table of thirty-seven cases will serve to show whether there is not already sufficient experience to establish the noxious medicinal action or poisonous nature of this drug. Out of thirty-seven cases here recorded, taken indiscriminately from authentic sources, sixteen proved fatal, and twenty-one recovered.[1] While among the fatal cases, some of the patients were not in a healthy condition, it is clear that among the recoveries, many would have died but for medical treatment, and early and copious vomiting or purging, or both. In some, death took place even in spite of these favorable symptoms (No. 26), showing that we have to deal with a substance which acts powerfully on the system by rapid absorption; and that when once absorbed, no treatment may avail to save the life of the patient.

In Case 17, we have a singular instance of the poison being swallowed under such circumstances as not to come in contact with the mucous coat of the stomach. The poison was probably in this case imbibed and absorbed through the pores of the paper. The local effects produced by this substance are manifested in Cases 16 and 19, in the softening and corrosion of the mucous membrane.

With respect to the *time of occurrence* of symptoms, this has no relation to the quantity of poison taken. In several of the cases we have no observation of the time. In Cases 5, 6, 7, 9, 12, and 26, the symptoms appeared early, or within a few minutes, the quantities taken being respectively, in grains, 20, 30, 27, (No. 9, unknown), 36, and 60. In Cases 11 and 18, the symptoms appeared in ten minutes, the doses being respectively, 54 and 20 grains. In No. 31, in a quarter of an hour, dose from 40 to 60 grains. In Nos. 29 and 30, in twenty minutes, the doses being the same in the two cases —10 grains. In Nos. 17, 22, 27, and 32, in half an hour, the doses being 6, 240, 120, and 15 grains. In Case 13, in which some hours are stated to have elapsed, six grains and a quarter were taken; the poison did not here act as it usually does. In Case 37, which is peculiar in the smallness of the dose (2 grains), and the state of disease of the patient, the

[1] Various deaths of patients under the antimonial treatment for pneumonia have been elsewhere referred to, ante, page 397, et seq. These have been chiefly cases of chronic poisoning by tartarized antimony.

usual symptoms did not appear for some hours. These variations obviously depend on the natural constitution of the person (idiosyncrasy), on the state of health or disease, on age, and on the state of the stomach and bowels at the time the substance is taken.

With respect to the *period of death* in the fatal cases. In No. 33, a child died in an hour from a dose of three quarters of a grain; in No. 32, in six hours; in No. 29, a child, in eight hours; in No. 30, a child, the period was thirteen hours; in No. 31, thirty-six hours; in No. 37, forty-one hours; in Case 12, four days; Case 15, five days; in this, however, it was caused by disease of the brain. In the other cases, the time has not been noted. Case 23, presents a peculiarity, as the patient here appears to have sunk many months afterwards, under the secondary effects of the poison, a result occasionally witnessed in cases of poisoning by the mineral acids and alkalies.

In reference to the *fatal dose*, it is rather to the *effects* produced than to the *actual quantity* swallowed, that we are to look. As vomiting and purging generally occur speedily, and the poison is known to be ejected, it would be irrational to assume that the dose swallowed remained unaltered in the body. It is important, too, not to fix this by actual weight. A quantity which may destroy an infant, will not destroy an adult female, and a dose which may kill a delicate woman, or an old person, might not act fatally on a strong and healthy man. A person labouring under disease may be more easily destroyed than one who is healthy, and lastly, there is that ever-varying condition of idiosyncrasy, in which, as it is well known, there is a state of constitution that renders a person more liable to be affected by antimonial compounds, than other individuals apparently in precisely the same conditions as to health, age. (See *ante*, p. 400.)

Then, again, a dose of ten grains administered at once, may not be attended with the same amount of danger to life as the same quantity given in small doses over some days or weeks. Let the reader observe and compare the effects produced on Mayerhofer (*ante*, page 383), by doses so small as a few hundredths of a grain; and then he will perceive that, within certain limits, the noxious action of the drug does not depend so much on the quantity placed in the stomach as on

the amount which finds its way into the organism, and the specific effects which it produces on the blood and organs when the system is contantly kept under its influence. I have elsewhere referred to the remarkable astringent effects observed by Dr. Billing, in doses so small as the one sixteenth of a grain every two hours.[1] Dr. W. Balfour, who wrote on this subject forty years ago, relates the case of a lady, aged 50, who laboured under difficulty of breathing, for which she was treated with antimony. He found that the minutest quantity of the ordinary medicinal solution of tartarized antimony produced nausea in this patient, and that it sometimes proved emetic. It was taken twice or thrice a-day, in doses so small that the whole quantity taken in three weeks did not exceed three grains.[2] Let us contrast this with a case which I have elsewhere quoted,[3] in which a robust man, aged 40, labouring under acute rheumatism, took this substance, first in a dose of eight grains, gradually increased, so that in ten days he had taken three drachms, or 180 grains, without any disorder of the intestinal canal, or other bad symptom. It is clear, therefore, that a dose which may be fatal to one person will not prove fatal to another. There are diseased conditions of the body, already pointed out,[4] in which large doses may frequently be borne without injury.

The smallest fatal dose in the preceding table, is (No. 33) in an infant, in which *three quarters of a grain* destroyed life in an hour; in an adult, *two grains* (No. 37), which destroyed life in forty-one hours. There was in this instance disease, but not of itself sufficient to account for death. It is proper to state, however, that the poisoning of a diseased person, if death can be clearly traced to the substance administered, involves a person in as great a responsibility as the poisoning of a healthy person. The acceleration of death is murder or manslaughter, according to the circumstances proved.

Two children died from the effects of ten grains, in eight

[1] *Ante*, page 379.

[2] 'Treatise on Emetic Tartar,' by Dr. W. Balfour, second edition, London, 1819, p. 144.

[3] 'On Poisons,' p. 483; and 'Medical Gazette,' vol. xxiv, p. 126.

[4] *Ante*, page 396.

and thirteen hours respectively (Nos. 29 and 30.) Fifteen grains destroyed one child in six hours (No. 32.) Sixty grains destroyed a healthy adult in ten hours (No. 26.) Doses of thirty-six and thirty-seven grains have killed adults in four and five days (Nos. 12 and 15.) Taking the facts here collected, it appears probable, that under circumstances favorable to its noxious operation on the system (indicated by failure of pulsation and collapse), a dose of from *ten* to *twenty grains*, taken at once, might destroy an adult, and if taken in divided doses, a smaller quantity than this might suffice. Large doses are very uncertain in their operation. In two instances in this table (Nos. 27 and 28), persons have recovered after taking doses twice, and even eight times, as great as the quantity which has proved fatal to a healthy man—namely, in No. 27, 120 grains, and in No. 28, 478 grains.

In the greater number of cases in which this substance is taken, either accidentally or designedly, timely warning is given by the early symptoms, and the persons recover under treatment. Tartarized antimony is not often selected by the suicide: one case is reported in the table (No. 26.) As a means of perpetrating murder, it is occasionally used; and sometimes, without such evil intention, it has been administered in small doses in articles of food, with a view of curing persons of habits of drunkenness. In the two following cases referred to me from the Eastern counties, in 1851, the intention to destroy life was clearly manifested by the quantity used, and the vehicle selected for administration. A mother and child breakfasted as usual on milk, the child having bread mixed with the milk. In less than a quarter of an hour after they had taken the milk, they were seized with violent vomiting and purging, burning heat in the throat and mouth, accompanied with a constant craving for cold water or fluids of any kind. The child was cold and prostrate as death itself, and pulseless, for *two or three hours*. The mother was similarly affected, but in a milder degree. A mixture of albumen and milk was freely given, but it was speedily ejected. These symptoms continued in both, more or less, throughout the day, and only abated towards evening. The child did not recover for twelve hours. It required stimulants and warmth

to restore it. Neither patient complained of much pain in the stomach and bowels.

The milk when examined was acid. It had a stong metallic taste. I found that it contained a quantity of tartarized antimony in the proportion of twenty-four grains to the ounce, making 192 grains in the eight ounces of milk. In addition to this, there were fourteen grains as a sediment, undissolved. The quantity taken by each patient was unknown.

The following case, in which there was an absence of the usual depression, was communicated to me by a friend. A young assistant-surgeon in the Crimea, took by mistake for a seidlitz powder, two drachms (120 grains) of tartarized antimony. In three minutes he experienced a burning sensation in his throat, and at the pit of the stomach. He then took an emetic of ipecacuanha. Some attempts were made to introduce the stomach-pump, and this caused violent vomiting. The patient drank a great quantity of decoction of bark, but he suffered for ten hours from severe vomiting and purging. A dose of opium procured for him a comfortable night, and the next day he was better. In contrasting the symptoms in this case with that of No. 27 in the table, in which the same quantity was taken by a young man, it will be perceived that there was a striking difference. In that case, there was great depression, with tetanic convulsions; in this, an absence of depression, probably from the more early and complete evacuation of the stomach.

In another instance, a young man swallowed inadvertently thirty grains of tartarized antimony dissolved in gin. In about ten minutes, there was a feeling of faintness, so that on attempting to walk, the patient fell. There was severe pain in the abdomen, with spasms. There were cramps in the calves of the legs, lassitude, with copious perspiration, and after a time, a free evacuation.

4. Summary of symptoms in Acute poisoning by Tartarized Antimony. Symptoms compared with those of Chronic poisoning.

In acute poisoning we find nausea and early vomiting of a violent kind, until the stomach is cleared and for some time

afterwards, as a result of the local irritation caused by the poison; pain in the stomach and bowels, followed by purging more or less violent; sense of burning heat and constriction or choking in the throat, extending through the whole length of the gullet to the stomach, difficulty of swallowing, soreness of the mouth and throat, followed by the peeling off of the lining membrane or the formation of aphthous crusts, at first whitish, but becoming subsequently discoloured, brown and black. (When this symptom occurs, it is probable that the same condition of the mucous membrane exists in the gullet, stomach, and part of the intestinal canal). In some cases there is great thirst, or increased flow of saliva. The vomited matters consist of a white stringy mucus, locking up solid portions of the poison, but sometimes tinged with blood or bile—motions liquid and bilious; cramps in the arms and legs; sometimes there are severe tetanic spasms; coldness of the surface, with clammy perspiration, attended with flushing, and a congested state of the head and face, a feeling of extreme depression, loss of muscular power, pulse small, contracted, and feeble; in advanced cases fluttering, and barely perceptible; respiration short and painful; livid or dusky appearance of lips and face, especially around the eyes; loss of voice, complete incapacity for any exertion; an eruption resembling that of smallpox occasionally showing itself on the skin; loss of consciousness and wandering or delirium.

These symptoms are not met with in every case; thus, vomiting and purging may coexist, or one may be vicarious of the other. In certain cases, neither of these symptoms may be present, and then those affecting the nervous system are generally more prominent. The intensity of the symptoms, the rapidity of their progress, and the speedy access of collapse, chiefly distinguish those of the acute from the chronic form. In the latter variety there is nausea, a loathing of food and incessant retching, without actual vomiting until food is taken. The vomited matters are sometimes white (mucus), but at a later period coloured by bile, and the symptoms recur with severity after each administration in food or medicine,—the prostration of strength being great in proportion to the frequency of this recurrence. There has been noticed a greatly increased secretion of urine. In no instance has

suppression been observed, as in cases of arsenical poisoning. Antimony appears to be carried off abundantly by the urine. In the acute form of poisoning, the presence of poison in the food may generally be perceived by the taste; in the chronic form, from the smallness of the quantity, there may be no taste.

One of the remarkable characters of the acute form, is that, in spite of the violence and severity in the symptoms, even when the collapse and depression appear to indicate impending dissolution, there is an astonishing power of recovery. When one large dose only is administered, the case proceeds steadily to recovery or death, generally the former if the case is placed early under proper treatment. In this respect, acute antimonial is distinguished from acute arsenical poisoning. In the latter, in spite of early treatment and the removal of the whole or the greater part of the poison, the case frequently terminates fatally. Should, however, another dose of antimony be taken at or about the time at which recovery is taking place from the effects of the first, it will be easily understood that the person will sink under the effects of the poison. If any doubt exist concerning the cause of the symptoms, *i.e.* whether they be due to bilious cholera or some form of gastritis or gastro-enteritis, then an examination of the urine should be made. If this be examined at intervals, it will be found to contain antimony, should the case be one of antimonial poisoning. An analysis directed to the matters vomited and the excreta, will also aid the diagnosis.

5. Summary of appearances after death in antimonial poisoning.

There may be found congestion of the membranes of the brain, with softening and congestion of the substance of this organ. An inflamed or aphthous state of the mouth, fauces, and gullet, extending throughout the whole, or confined to the mucous membrane of the fauces and the cardiac end of the gullet.[1] The mucous membrane of the stomach is more

[1] In the medicinal use of antimony for pneumonia in large doses, Boudet observed that there were local irritant effects on the fauces in twenty-six out of one hundred and forty-four cases.

or less reddened in patches or spots as a result of inflammation, the membrane softened or corroded, and easily removed by friction, sometimes covered with false membrane or aphthous crusts; the surface darkened, inflamed, and ulcerated; small ulcers with pustular exudations occasionally found; the contents of the stomach of a dark brownish colour, consisting chiefly of mucous matters, coloured either by blood, bile, or by a mixture of both. The peritoneal or external coat of the stomach has been found inflamed; the intestines present similar appearances, the inflamed portions of mucous membrane being seen chiefly in the duodenum, cæcum, and rectum; the contents of the intestines bilious or bloody, with much mucus; aphthous ulcerations in the glands of the small intestines, the lungs showing more or less congestion in portions of the lobes; the heart empty, or if blood be contained in its cavities this is dark-coloured and liquid; the blood liquid throughout the body. In cases of chronic poisoning, the liver enlarged, softened, and its structure easily broken. The organs of the body have been found well preserved.

These appearances will necessarily vary according to the duration of the case. When life is protracted, there may be the appearances of gastro-enteritis in a severe form.

The effect of antimony on the liver is worthy of observation. It is stated that this mineral causes an enlargement of the organ, and at the same time renders its structure brittle. In the tabulated cases this condition of the liver is only particularly noticed in No. 37. It is an appearance rather connected with the chronic than the acute form of antimonial poisoning. These changes in the liver, as the result of antimonial poisoning, were first observed by Magendie. In animals killed by a repetition of small doses (one grain at a dose), he found the liver changed in colour and consistency.[1]

This effect of antimony on the liver has been specially adverted to by MM. Millon and Laveran in their recent experimental researches.[2]

[1] 'De l'Influence de l'Emétique sur l'Homme et les Animaux,' p. 1813, p. 58.

[2] Bouchardat, 'Annuaire de Thérapeutique,' 1847, p. 136.

This condition of the liver in a dead body may probably serve to aid the medical practitioner in forming an opinion whether the antimonial poisoning is of the chronic form. M. Morin states that the poultry-keepers of Alsace adopt the practice of

6. Chemical processes for the detection of Antimony in the body in a free and in an absorbed state.

A few remarks may be made on this subject, as it constitutes an important branch of medical evidence. It is unfortunate that the chemical evidence has been either overlooked or neglected, in the majority of cases of antimonial poisoning that have hitherto occurred. Among the sixteen fatal cases recorded in the table (*ante*, page 409), antimony is stated to have been sought for in four only; and in these the analysis was simply confined to the *contents* of the stomach. In some instances, there was no inspection, and therefore no opportunity for the search. In Nos. 29 and 30, the cases of children that died in eight and thirteen hours respectively after having taken ten grains of the poison, it is stated that no antimony was found in the stomach in either case. In No. 31, from forty to sixty grains were taken, the person died in thirty-six hours, and slight traces only of antimony were detected in the *contents* of the stomach. In No. 32, a child, death occurred in the short period of six hours, after fifteen grains had been administered, and the analysis of the contents of the stomach was performed by a skilful chemist, Mr. H. H. Watson of Bolton, with the result that no antimony was present. I have elsewhere reported (see *post*, p. 450) a case in which three grains were taken in solution by a man, and he died from another cause about twenty hours afterwards; not a trace of antimony was found in the stomach, the intestines, or their contents. Hence it appears that this poison passes more rapidly out of the stomach and bowels than arsenic. These facts are of importance in considering the absence of tartarized antimony from the contents of the stomach and intestines, or its presence in very minute proportion, in cases in

adding sulphide of antimony to the food on which the geese in that district are fed. This causes an enlargement of the liver, and increases the fatty deposit. The livers thus morbidly fattened are employed for making the well-known *Pâtés de foie gras* of Strasburg, so highly prized by gourmands. M. Morin has analysed the pâtés, and has discovered antimony in them, but the quantity is not sufficient to produce noxious effects. This, however, indicates one channel by which antimony may be insidiously introduced into the human body and temporarily incorporated with the tissues. See 'Journal de Chimie,' 1849, p. 261.

which criminal poisoning by this mineral is alleged. The absence of the poison or its presence in small quantity, is supposed to create an enormous difficulty in medical evidence, but the difficulty, if it be one, is of nature's own creating. If a poison possesses highly emetic and highly purgative powers, it must be thrown off to a greater or less extent as a result of its own operation, so long as the person lives.

Nevertheless, it is laid down as a positive rule by those who think that fixed laws must govern these effects of poisons, that if on an analysis of the stomach and bowels, as well as their contents, either no *free* antimony is obtained by the analyst, or the quantity procured is so small that it is not sufficient to poison another person, it is impossible that the person can have died from antimonial poisoning! The fallacy of this reasoning, opposed as it is to the laws of physiology and chemistry, it is scarcely necessary to point out.

With respect to the detection of *absorbed* antimony, the processes for this are of comparatively recent discovery. The process of Marsh was suggested and used by Orfila in 1840, and the process of Reinsch was employed in 1846. In none of the fatal cases in the table, was *absorbed* antimony sought for, or probably some would have been found deposited in the liver and other organs.

1. *Chemical tests in the pure state.*—Tartarized antimony is very soluble in water (*ante*, page 378), and may be obtained from a few drops of this solution in crystals of mixed octohedral and tetrahedral forms. It is not volatile; when heated on mica in air, it is charred, and there is an odour resembling that of burnt tartaric acid. It leaves a carbonaceous residue. When heated in a close tube, it is charred without fusion, and no metallic sublimate is evolved. One test is sufficient to identify the presence of, and to separate the antimony, the active ingredient, namely, a current of sulphuretted hydrogen gas. The antimony is precipitated as an orange red, or deep red compound,—hydrated sulphide of antimony. When this is well washed on a filter, dried, and weighed, it will enable the operator to calculate the quantity of antimony present. The peculiar orange red colour of the hydrated sulphide of antimony distinguishes it from other metallic sulphides; but it is

proper to employ corroborative tests to determine its nature. These are: 1. The precipitate is not dissolved by a few drops of weak solution of ammonia. 2. When dried and warmed with a few drops of strong hydrochloric acid, it is immediately dissolved. The liquid should be boiled until it is colourless. If it be then added drop by drop to a quantity of water, a white precipitate (oxychloride) is thrown down. By precipitation, under these circumstances, antimony is known from all metals excepting bismuth; but the bismuthic precipitate thus formed, is blackened by sulphuretted hydrogen, while the antimonial precipitate acquires a yellow or orange colour.

2. *Process for organic liquids.*—In testing the liquid contents of a stomach, or liquid articles of food, it is desirable that a portion should be filtered. The discovery of antimony in the filtered liquid will show whether any antimonial preparation (tartarized antimony[1]), is dissolved. A similar experiment should be made with the fluids of the intestines. A question of this kind is sometimes of importance on trials. Unless this preliminary examination be made, an analyst may not be able to say whether he is dealing with tartarized antimony, or some small particles of antimonial powder.

If the antimony is dissolved in sufficiently large quantity in the organic liquid to give a precipitate with sulphuretted hydrogen, the chemical question is easily solved. The precipitate is treated as above described, and the presence of antimony is thus placed beyond doubt.

Tartarized antimony may, however, be present in an organic liquid, (*e. g.*, the urine), but in a proportion so small as not to be precipitated by a current of sulphuretted hydrogen gas. There may be no change of colour, and the analyst may be inclined to suppose that the metal is not present. In this case, Reinsch's process should be employed. The liquid is concentrated to a small bulk, and then from one sixth to one seventh of its volume of *pure* hydrochloric acid is added to it. It is

[1] The only other soluble antimonial compound met with in pharmacy and chemistry is the chloride. This is, however, known by its powerfully corrosive action, and its decomposition by liquids. Hence, if the filtered liquid contain antimony dissolved, and there are no signs of the corrosion of the tissues, it is a fair inference that it exists in the form of tartarized antimony.

boiled, and while boiling, a small piece of thin copper foil freshly brightened, or a piece of fine copper gauze may be introduced. Sooner or later, according to the quantity present, antimony is deposited on the copper, producing a grey deposit, with a reddish-violet, or purple tint, if the quantity be small, or iron grey or black, if comparatively large. If no deposit is observed at first, the whole of the liquid must be boiled down on the copper before the inference is drawn that antimony is absent. If the copper be removed without any metallic tarnish or deposit upon its surface, there is no antimony present. If it has acquired a metallic deposit, then, after well washing and drying it, further steps must be resorted to in order to determine that it is really antimony with which the copper is coated.

Hugo Reinsch, who made the discovery of this simple process in 1846, considered that antimony was sufficiently indicated: 1, by the colour of the deposit being violet; 2, by the copper foil, when heated, yielding no distinct crystalline sublimate like arsenic; but it was long felt by chemists that these characters, affirmative and negative, were not sufficient for medical evidence. In some researches on the subject in 1855, I found that by deflagrating the coated gauze by small portions, with a small quantity of fused nitrate of soda or potash in a platina or porcelain capsule, that the deposit was immediately removed from the copper; antimoniate of soda was formed if the deposit was antimonial; and by acidulating the liquid with hydrochloric acid and passing into it a current of sulphuretted hydrogen, hydrated sulphide of antimony was procured.

A better method of corroboration has been suggested by Dr. Odling.[1] The copper with the supposed antimonial deposit is boiled in a small quantity of water, rendered feebly alkaline by pure potash, and coloured of a light crimson or pink tint, by the addition of a few drops of a weak solution of permanganate of potash. In a short time, the copper loses the whole of the metallic deposit; the liquid becomes colourless, and a brownish substance, (hydrated peroxide of manganese), falls down, which should be separated by filtration. A few drops of hydrochloric acid are added to the filtered liquid, and

[1] 'Guy's Hospital Reports,' October, 1856.

a current of sulphuretted hydrogen passed through it. If the deposit were antimonial, antimoniate of potash would be first formed, and the antimony would be thrown down in the last stage as hydrated orange-red sulphide. Here then, permanganate of potash is substituted for nitrate as an oxydizing agent, and undoubtedly with advantage, as no sulphur is separated with the sulphide under these circumstances. Mr. Watson, of Bolton, has since suggested a still more simple plan, rendering it unnecessary to employ the permanganate of potash. He suggests that the coated copper should be boiled in a weak solution of potash only, the metal being partly exposed to air by drawing it out of the alkaline liquid, and then again returning it. In this way, the antimony is oxidized by the air in contact with an alkaline solution, and antimoniate of potash is formed. In about five or ten minutes the copper will have lost the deposit, and the liquid may then be filtered, acidulated with hydrochloric acid, and treated with sulphuretted hydrogen. The orange-red sulphide of antimony, of its characteristic colour, is thrown down either immediately or on allowing the liquid to stand for a short time. This corroborative test for Reinsch's process can be universally adopted, as potash is procurable when the permanganate may not be forthcoming. I have tried these modes of testing the deposit on copper obtained by Reinsch's process, and find them to be quite satisfactory, even for very small quantities. The precipitated sulphide obtained, may be, however, too small to allow of the subsequent solution in hydrochloric acid, and precipitation by water. This additional corroboration is not necessary under the circumstances. Potash may contain oxide of lead, and hydrochloric acid may contain antimony. These liquids should therefore be tested, and their purity clearly ascertained before they are employed for the purpose above mentioned.

If the permanganate of potash be employed in a medico-legal analysis, this must also be tested in order to exclude the possibility of antimony being introduced by the chemical reagents,—a proof rigorously insisted on when the quantity found is very small.

The presence of antimony as an impurity in hydrochloric acid is not common; but in the year 1856, I had a sample

sent to me from a provincial town, which contained so much antimony, that on mixing it with water, it gave an abundant precipitate of oxychloride. The acid had been employed with carbonate of soda in making unfermented bread, and it had produced a large amount of sickness, the cause of which could not at the time be explained.

Although antimony is not found to be a normal constituent of the healthy human body, it is obvious that by this and other means, it may occasionally find its way into the system. Hence the great importance of not relying too much on the chemical evidence of its presence in small quantity, when there is no knowledge of symptoms preceding death, or of appearances in the dead body.

3. *In the tissues and organic solids. Absorbed antimony.* —It was long since stated by Orfila that antimony and arsenic were deposited in the organs, *e. g.*, the liver, in a form to be partially dissolved by water. I have verified this statement by experiment in cases of poisoning. A few ounces of the liver of a person who died from the effects of tartarized antimony were boiled for an hour or longer in water; the aqueous decoction was filtered, and the filtered liquid tested. Antimony was separated by Reinsch's process from the filtered aqueous decoction. When hydrochloric acid is added to the water, the tissue yields antimony in much larger proportion; a fact which shows that the antimonial compound is, at least in part, intimately associated with the tissue of the organ. The proportions of acid and water required are, one part of strong acid by measure, to six or seven parts, by measure, of water. Incineration, or carbonization by sulphuric acid, are not required for the detection of antimony in the liver or other organs by Reinsch's process.

Marsh's process has also been employed in the search for antimony in the tissues. A part of the liver or other organ is cut into small pieces, and mixed with about half its weight of concentrated and *pure* sulphuric acid. The mixture is then heated to carbonization. The dry carbonized residue is treated with a small quantity of pure and strong hydrochloric acid. This acid liquid, drained from the carbonized mass, is introduced into Marsh's apparatus, and the gas

proceeding from it, tested. 1, Previous to kindling, the antimonuretted hydrogen reduces in the cold nitrate of silver in solution; 2, when kindled, it burns with a pale, lemon-coloured flame, evolving a white smoke (oxide); 3, a piece of glass acquires, when so placed as to intercept the flame about its centre, a deep coal-black deposit, with grey rings; the bright metallic lustre of antimony appearing on the reverse side of the glass. The coal-black colour distinguishes this deposit from that of arsenic, which is hair-brown, but a better corroborative test is to pour on the deposit a few drops of sulphide of ammonium, and evaporate slowly to dryness. If antimony be present, an orange-red stain is left on the glass, not easily dissolved by weak solution of ammonia.

This is said to be a more delicate process than that of Reinsch's. Assuming that this is the case, it may be observed that in medico-legal researches, it is not so much delicacy as *certainty* which is required for evidence; and certainty is abundantly supplied by Reinsch's process, up to very minute fractions of a grain. Beyond this, whether Marsh's or any other process be relied upon, it is not desirable to go.

Antimony, even in a soluble form, does not readily disappear from the dead body after interment. If a person dies with absorbed or free antimony in his body, some portion of the metal may be extracted, probably so long as the viscera remain. In the case of Ann Palmer, the body had been interred for a period of nearly fifteen months, antimony was found in the free state in all parts of the alimentary canal, and in the absorbed state, more or less in all the organs. One ovary alone yielded the fiftieth part of a grain. The antimony had partially undergone a chemical change, as a result of putrefaction. In the stomach, a portion had been converted to orange-yellow sulphuret, which dyed the coats in a streak or stain from the inside to the outside. In the rectum it was also partially changed to sulphuret. In this case, antimony manifested an antiseptic property like arsenic, for all the parts in which the metal was found were well preserved. In the case of Ann Bacon, whose body was exhumed in 1857, after twenty-one months' interment, antimony was found in the intestines. The presence of the metal was here traced to some small doses of antimonial medicine which had been

given to deceased during her last illness, and shortly before her death.

The plan adopted by MM. Millon and Laveran for the detection of antimony in organic liquids and solids, consisted in the immersion of a freshly scraped bar of pure tin into the cold liquid, acidulated with about one tenth part by measure, of pure hydrochloric acid. Antimony, if present, was deposited on the tin in a black powder.[1]

As much confidence has been placed in their experimental results on absorption and elimination, it would have been more satisfactory had they employed one of the two processes above described, or at least corroborated their results by a further analysis of the black deposit.

There are two circumstances connected with the chemical evidence which require notice; 1, as to the *quantity* of antimony found in a dead body; 2, as to its *diffusion* by imbibition after death. It has been already stated that in the cases of antimonial poisoning hitherto examined, the quantity found in a *free* state in the contents of the stomach and bowels, has been only a minute fractional proportion of the quantity swallowed. The amount of *absorbed* antimony found deposited in the organs is always small. In general, from one grain to three or four grains would probably be the whole amount that would be separated by chemical processes from those organs and parts of the body which are usually submitted to analysis for absorbed antimony. In drawing any inference, therefore, from the quantity of absorbed antimony detected in a given case, for or against the question of death from antimonial poisoning, it is important to attend to the following points:

1. Whatever quantity may have been taken, the organs only retain a certain portion, always small, and constantly decreasing by elimination, so long as the patient survives.

2. The poison penetrates by absorption all parts through which the blood is circulated. According to Millon and Laveran, it actually goes into the bones and fat! It is extensively diffused and deposited through the whole muscular system. The analyst, for the purposes of evidence, generally confines

[1] 'Comptes Rendus,' 1856, xxi, p. 637; 'Annuaire de Chimie,' 1846, p. 715.

his research to the viscera of the abdomen and chest, or to parts of them. Hence it follows, that the antimony which he extracts is really only a small proportion of that probably existing throughout the body of the deceased. In a body weighing one hundred and fifty pounds, the analyst may have extracted the metal out of only five to ten pounds of the organic solids. To assume, therefore, that *that* which he extracts and produces, is all that remains in the body, is evidently an error. If so much importance is attached to the absolute quantity of antimony obtained in a chemical analysis, it is only proper for the purposes of justice that the analyst should be authorised to extend his operations to the whole of the body, including the flesh and skeleton, and that the great length of time and skilled labour which would thus be exacted of him should be liberally compensated. At present, the 'Medical Witnesses Act,' limits the analysis to the *contents* of the stomach or intestines, and the fee to the sum of two guineas.

It may, however, be reasonably inferred from facts already known, that the whole of the absorbed antimony, if extracted from the body, in a case of antimonial poisoning, would not make up a quantity sufficient to constitute what is called a *fatal dose;* and, as we have already seen, this quantity can rarely be found in the contents of the stomach or bowels. Hence it is obvious that the chemist is virtually called upon to supply *ex naturâ rei*, impossible evidence. The discovery of the poison in the body by its properties in a clear and unmistakeable form, should of itself be sufficient for the chemical proof; the actual quantity either separated or calculated to exist is immaterial in judging whether death has taken place from the poison or not. The small quantity found may be the residue either of a large or of a small dose, and yet the medical facts of the case may show conclusively, either that the deceased died from its effects, or that it was innocently taken as medicine, and that it did not cause death. In one clear case of antimonial poisoning, less than four grains of antimony, free and absorbed, were found in the viscera of the chest and abdomen: in two other cases the quantity found did not exceed a grain and two grains respectively. Is the fact of death from antimony to be absolutely negatived because the

quantity found is small? Assuredly not, for antimony does not kill suddenly like prussic acid, and there is generally time for the greater part of the poison dose swallowed to be expelled from the body. That which is found by the chemist is simply the residue which may remain in the body at the time of death.

The correctness of this reasoning would be immediately tested by the law laying down, from medical evidence, in precise language, what it understands by a *fatal dose* of tartarized antimony, and declaring that on any charge of murder by antimonial poisoning, this quantity of the substance (say *twenty grains*) must be extracted by chemical processes from the body of the deceased, or the question of death from this poison cannot be entertained. As children have been killed by ten grains and less, and persons labouring under disease have died from smaller quantities than this, it would be necessary, on this principle, to have a scale of fatal doses determined by age and bodily condition. The present mode in which this serious question is dealt with at inquests and on trials, is absurd,—inconsistent with the well-known laws of physiological chemistry, and only calculated to shelter criminals from responsibility for their acts.

Diffusion.—It has been supposed that the presence of antimony in the liver, heart, spleen, &c., would not show absorption during life, because the presence of the poison in these organs might be owing to imbibition or diffusion after death. This implies, however, either that the poison must be somewhere in the body at the time of death, or that it must have been injected afterwards. The latter supposition appears untenable, because there would be an absence of evidence from symptoms and appearances, without which the mere discovery of antimony in a body would not indicate antimonial poisoning. If the person dies with tartarized antimony in some part of his body, then this is a fact which must be accounted for; but it alone will neither establish poisoning, nor fix a crime upon an individual. I believe, from the examination of the dead body, that this objection to medical evidence is hypothetical, and based upon fallacious experiments. If the antimony thus radiated to all parts by imbibition from the stomach, the metal would be found in greater proportion in parts near to or in contact with the stomach, and in a decreasing proportion according to dis-

stance. In no case can we conceive that every particle of antimony would pass from the interior of the stomach and incorporate itself with the liver, rectum, or other remote parts. It has, however, been found in these organs when it has not existed in the stomach, and the proportion found has borne no relation to the vicinity or contact of the organ with the stomach. In the case of a dead body which had been lying in the grave nearly two years, I found antimony in the intestines, but the cellular membrane, fat, and mesentery adjacent, contained none. A larger proportion is generally found in the liver than in the spleen; and in a dead body (a case of antimonial poisoning) I found more in the rectum than in the stomach! The facts of a case properly investigated will show that this objection to the evidence of absorption during life, derived from the presence of antimony in the organs, is without foundation. Imbibition doubtless goes on to a small extent in a dead body, but not so as to affect inferences based on proper observations.[1]

7. The Absorption, Deposition, and Elimination of Antimony.

The fact that antimony was absorbed into the blood was determined by Magendie, in a set of physiological experiments, in the year 1813, but the metal was not chemically detected in the blood and viscera until Orfila's researches on this subject, in the year 1839.[2] Tartarized antimony, in the dose of from fifteen to twenty-five grains, dissolved in water, was introduced into the stomachs of dogs, and the œsophagus tied to prevent vomiting. The animals died in a *few hours*. The liver and kidneys yielded a comparatively large quantity, the spleen, lungs, and heart, contained barely traces of antimony. In an experiment in which thirty-one grains, in powder, were introduced into a wound in the thigh of a dog, the animal died in *twenty hours*. The lungs, heart, and spleen, yielded not the least trace of antimony, and the liver gave only a small deposit. Two ounces of urine contained in the bladder

[1] See, on this subject, Orfila, 'Toxicologie, i, p. 384, 1852.

[2] 'Mémoires de l'Académie de Médecine,' tome viii, p. 509, March 10, 1840. See also 'Annales d'Hygiène,' 1840, i, p. 474.

yielded a large quantity. In other experiments in which the powder was applied to wounds in quantities varying from two grains to six, the following results were obtained. In one dog, destroyed *an hour* after the application, there was no antimony in six ounces of blood, and only a small quantity in the liver; in another, destroyed in *four hours*, six ounces of blood taken from the aorta, and six ounces taken from the vena cava, gave respectively no indications of antimony. The liver gave a great number of antimonial deposits, and the urine from the bladder also gave numerous deposits. In a third experiment, the dog died in *seventeen hours*; the liver gave only traces of the metal, while the urine yielded numerous large deposits. Two grains of tartar emetic had been applied to the wound in this case. In a fourth experiment the same dose was applied, and the animal died in *thirty-six hours*. The liver yielded no antimony; the urine contained it abundantly. From these results, Orfila came to the conclusion that antimony was rapidly absorbed and as rapidly carried out of the body by the urine, so that after ten, twelve, or fifteen days, none would be found in the liver and kidneys. MM. Millon and Laveran proceeded differently, and obtained different results. 1. A dog was fed for ten days with food containing a daily dose of four and a half grains of tartar emetic, making, in the whole, forty-six grains. The dog died *six days* after ceasing to take the antimony in its food, and obviously from the effects of that substance which some loosely call a medicine, and not a poison. The metal was found in the liver, muscles, coats of the intestines, the lungs, and the brain. 2. A second dog similarly treated died *thirteen days* after the withdrawal of the antimony. The metal was found in the various organs, but the brain appeared to be the most strongly impregnated. 3. A third dog, which recovered from the antimonial treatment, died suddenly *six weeks* after its cessation. The antimony was found in appreciable proportion in the liver and fat, but it had especially accumulated in the *bones, i. e.*, in a tissue in which its presence is quite compatible with the healthy exercise of the bodily functions. 4. A fourth dog, was killed *three months and a half* after the withdrawal of the antimony. On analysis, the metal was chiefly found in the fat. The liver contained a small quantity,

as well as the bones and other tissues, but the fat contained ten times the proportion found in all the other parts. 5. In this experiment the dog was killed *four months* after the antimony had been withdrawn: in this the antimony was chiefly accumulated in the bones; the liver also contained a great deal, the other tissues contained very little. 6. A young bitch took tartar emetic for five days, about fifteen days before parturition. The animals were killed, and the livers of the pups yielded antimony.[1] Dr. Birkbeck Nevins has obtained some useful results by experiments on rabbits. The antimony was given in doses varying from half a grain to one or two grains, over a period of several days; the total quantity given varying from twelve to seventy-two grains. The absorbed metal, like arsenic, was found by chemical analysis to be widely diffused throughout the body. It was most abundant in the liver and the kidneys. In the blood it was sparingly found at any time, and in the muscles only a trace after the longest continued administration. It was also found in the livers and kidneys of the immature fœtuses of one rabbit, as well as in the placentas. It appeared to exert a fatal influence on the fœtuses in utero. 1. A rabbit which had taken, in divided doses, four grains during twenty-four hours, was killed *four hours* after the last dose. Antimony was found in the stomach, but not in the large and small intestines. The liver contained a faint trace, but there was none in the blood or in any of the other parts examined. 2. Five grains were given in three days, and the animal was killed four hours after the last dose. Some antimony was found in the stomach and large intestines, a trace in the kidneys,—a copious deposit was procured from the liver, and a well-marked deposit from the blood. 3. A rabbit died, poisoned by twelve grains, about *sixteen hours* after the last dose. Antimony was detected in small quantity in the stomach, intestines, kidneys, lungs, and blood; it was most abundant in the liver and in the urine. 7. This animal died poisoned *seven hours* after the last dose, the whole quantity administered having been fifty-one grains, given in fifteen days. Antimony was found in the large and small intestines; copiously in the liver, in the spleen, and

[1] 'Comptes Rendus,' 1846, i, p. 1043; Orfila, 'Toxicologie,' 1852, i, 628; Bouchardat 'Annuaire de Thérapeutique,' 1847, p. 134.

urine; less in the kidneys and lungs. 9. This animal was killed fifteen days after the last dose, twenty-three grains having been given during a period of fifteen days. No antimony was found in the stomach and intestines; there was not a trace in the liver, but the metal was found in the bones. 10. Thirty grains were given over a similar period, and the animal was killed fifteen days after the last dose. A trace of antimony was found in the stomach, cæcum, kidneys, and lungs; none in the liver; the presence of the metal was very decided in the bones, urine, and excrement. 11. In this experiment fifty-one grains were given in fifteen days, and the animal was killed *one month* after the last dose. There was no antimony in the stomach; only a slight trace in the liver and lungs; more in the kidneys. The largest proportion was in the bones. Twenty-one days after the last dose, the urine and excrement gave decided traces of antimony.[1] From these experiments it appears, that the antimony was found in the bones on the fifteenth day after the last administration, and was still present on the thirty-first day in another experiment.

Dr. Mayerhofer, of Munich, gave to a healthy dog fifteen grains of tartar emetic, dissolved. Seven hours afterwards, six grains, in solution, were rubbed on the thighs and abdomen. The animal died in fourteen hours, and shortly before death two grains were given by the mouth. On analysis, antimony was found in the stomach in a soluble form, probably from the recent administration. The metal was also detected in the blood of the heart, of the portal vein, in the liver, lungs, brain, intestinal canal, as well as in the urine passed during life.[2] To some sheep affected with pneumonia, one drachm of tartar emetic was given medicinally (March, 1857). They were killed within about twelve hours of taking the medicine; and, on analysis, I found, in the fleshy parts of the legs of the animals, a considerable deposit of antimony.

This metal appears to be eliminated through the *milk*. A writer in the 'Medical Times and Gazette' (May 23d, 1857, p. 517), states that he administered to a cat which had given birth to five kittens, one third of a grain of tartar emetic twice at an interval of eight hours. These doses caused vomiting,

[1] 'Liverpool Medical Journal,' 1857, No. 1, p. 46, et seq.

[2] Heller's 'Archiv,' 1846, iii.

and so much prostration, that the course was changed to one twelfth of a grain, which dose was repeated twice daily. Three days after this, one of the kittens was drowned, and its viscera subjected to analysis, with the result of detecting distinct evidence of the poison. Three days later, the mother still receiving the poison, two of the other kittens were killed. In these the poison was detected in the heart, including its contained blood, and lungs taken together; in the liver and kidneys taken together, and in the stomach and intestinal canal, with their contents.

From the experiments of Dr. Brinton, of King's College, it appears that antimony in certain cases in which it has not been introduced into the *stomach*, is eliminated from the system by the mucous membrane of this organ. He injected into the superficial femoral vein of a large dog, ten grains of tartarized antimony, dissolved in four ounces of water. The animal instantly fell into a state of collapse without vomiting or purging. At the end of fifteen minutes it was killed, and the contents of its stomach, then in the act of digestion, were collected. They were found to contain tartar emetic in large quantity (the quantity not stated). Dr. Brinton thought that the proportion present in the gastric fluids, exceeded that in which it was mixed with the blood of the animal; in short, that the poison was not only transferred from the thigh to the stomach, but that it was concentrated as well as eliminated in this latter cavity.[1] It is unfortunate that this chemical question was not determined by experiment. It would have been an interesting fact to have ascertained, as the quantity injected into the blood was accurately known, what proportion of antimony was contained in the gastric fluid as well as in the fluids of the intestines, how much remained in the blood, and how much was deposited in the liver and other organs. The result as it stands, simply shows that some portion of antimony is eliminated by the stomach, within the short space of *fifteen minutes* after it has been injected into the blood of the femoral vein. Orfila ascertained with respect to arsenic, that the alimentary canal contained a portion of the poison in a dog killed in four hours by three grains applied in a solid state to the cellular tissue. It has been supposed that these results are adverse to

[1] 'Medical Society of London,' 'Lancet,' May 31st, 1856, p. 591.

any conclusion respecting recent administration, when antimony is found in the contents of the stomach; but this objection could only arise in those cases, in which the person alleged to have been poisoned by antimony, had received the poison by injection into the blood—or by direct application to a wound or ulcer. Such a case as this has, I believe, never yet presented itself on a charge of poisoning; the poison has always found its way into the body, either by the stomach or by the rectum, and the question, therefore, practically resolves itself into this:—How long can tartarized antimony, when swallowed, remain in the stomach? The answer must depend on the circumstances proved in each case. I am not aware of any facts showing that the stomach is a medium of elimination for antimony, when the metal has been once removed from it and deposited in the liver and other organs as a result of absorption from the stomach. It would be necessary to assume that the stomach and its contents had first been entirely cleared of every trace of the poison, and that the poison subsequently returned to this organ, from the parts to which it had been conveyed, and was again deposited in the contents! Adversely to this assumption, however, it has been found after death, that the stomach has frequently contained no trace of antimony, while the poison has been found rather strongly deposited in the liver and other parts. This negatives the assumption that when the stomach is once cleared of the poison, its mucous surface becomes in the *human body* a medium of elimination.

It is an important fact in reference to this question that in instances of poisoning by it, in which there has been an opportunity of making an analysis, antimony has *not* been found in the stomach, while it has been found abundantly in the liver, spleen, and kidneys. The cases Nos. 29, 30, and 32 in the table (p. 413), show that this theory as applied to the human subject is erroneous. Two children were poisoned by ten grains, and one by fifteen grains of tartarized antimony. They died respectively in eight, thirteen, and six hours. No antimony was found in the stomachs or intestines. It cannot be doubted, as they died from the effects, that some portion had been absorbed and deposited in the tissues of the organs.

The absence of antimony from the alimentary canal, in a

case of antimonial poisoning, is a clear proof that the mucous surface is not an eliminating medium, or some antimony would be found there. In the case of M'Mullen (Liverpool Summer Assizes, 1856,) it was distinctly proved that the deceased had died from antimony. Mr. Watson, of Bolton, made the analysis, and found no antimony in the stomach or contents, while he found it most abundantly in the liver, spleen, and kidneys. Such a result is inconsistent with the supposition that the stomach is an eliminating surface for antimony deposited in other organs. In fact, if that were so, as long as there was any antimony in the body, it ought to be found in the stomach. When human beings are poisoned by injecting tartarized antimony into veins, or thrusting the powder into wounds, the results may be different; but experiments so conducted are not applicable to ordinary cases of poisoning in the human subject.

Less reliance in proof of recent administration by the stomach or rectum, can be placed on the discovery of antimony in the intestinal canal. Antimony is eliminated in the bile, and as this liquid traverses the whole of the intestines, the metal found may have been derived from this secretion. If, however, the poison be present in the intestines in proportionally large quantity,—if it be in a solid form,—if there be no poison in the bile taken from the gall-bladder, if the poison in the intestines be mixed with blood, mucus, or food, and not with bile, then this theory would not explain its presence in the intestines. Assuming that the intestinal mucus itself may become, in certain cases, a medium for the elimination of the poison from the body, some of the above-mentioned conditions would be inconsistent even with this supposition.

Observations regarding the absorption and elimination of antimony in the human body, are at all times more valuable than those derived from experiments on animals, but, unfortunately, these are few in number, and the facts as yet known scarcely admit of a satisfactory generalization. Their importance, however, cannot be over-estimated.

Orfila has collected the following facts: 1. In a patient affected with pneumonia, eighteen grains of tartarized antimony were given in twenty-four hours. Four ounces of urine collected during this period, yielded metallic antimony. Much urine was lost, and there had been much purging. 2. In another case,

nine grains were taken, dissolved, during the same period. About five ounces of urine, passed twelve hours after the last dose, yielded as much antimony as Case 1. 3. The urine of four patients affected with pneumonia, to whom from twelve to eighteen grains of tartar emetic had heen given during twenty-four hours, yielded antimony; but the same process did not reveal the presence of any antimony in one patient who had taken only nine grains during that period. Some of these patients had had alvine evacuations. Martin Solon detected antimony in the urine of a patient who had taken only four grains of tartarized antimony, and who had had neither vomiting nor purging. 4. Tartarized antimony was prescribed in large doses for a patient. The urine collected *three days* after the last dose had been, taken yielded no antimony. 5. Antimony was found deposited in the liver, spleen, and kidneys of a patient who died *fifteen hours* after she had taken about eight grains of tartar emetic. This had caused some purging but no vomiting.[1]

From the researches of MM. Millon and Laveran, it appears that there may be intermissions in the elimination of antimony. In giving to their patients from one grain and a half to five grains of tartarized antimony, they remarked that it was eliminated by the urinary secretion, but in some instances slowly and unequally. They therefore examined the urine, not only several days after the introduction of the medicine, but for some days after it had ceased to appear in this secretion. They then found that its elimination underwent a well-marked intermission, and that, in a most unexpected manner, it appeared to remain for a certain period fixed in the body. In two patients they detected traces of it twenty-four days after its administration. In the body of one who died of phthisis, they found antimony in the liver. In a third case, antimony was detected in the urine after twenty days; in two others after nineteen days; and in three others after sixteen, seventeen, and eighteen days respectively[2]. The fact of the *intermittent elimination* of poisons is of importance, as it tends to show that, even when traces of poison cease to appear in the secretions, it does not in all cases follow that the substance is entirely expelled from the body.

[1] 'Memoirs of the Academy of Medicine,' April 7th, 1840.

[2] 'Comptes Rendus,' 1845, ii, 638.

Among medico-legal cases which may be cited in illustration, are the following: A woman, æt. 41, died under suspicious circumstances, in February, 1845. About a week before death, some doses of tartarized antimony (some centigrammes (0·154 gr.), had been prescribed for her by her medical attendant. The body was exhumed and examined on the 18th February. Traces of arsenic were found in the contents of the stomach and of arsenic and antimony in the stomach and bowels, but no trace either of arsenic or antimony in the liver, lungs, and blood.[1] A patient of M. Marchal's, in a Parisian hospital, was treated with tartarized antimony in large doses. He died eight days after the cessation of the antimony. The result of a chemical examination was, that the liver contained a considerable quantity of antimony, that the kidneys contained a smaller quantity—that the blood also yielded traces of the metal, while the brain contained much less than the other organs and the blood.[2]

A child, eighteen months old, died twelve days after certain medicines, including tartar emetic had been given to it. As there was some suspicion that death had been caused by mineral poison, three fourths of the intestines were minutely examined, but not a trace of antimony was found therein.[3] The case of M'Mullen,[4] who died from the effects of small doses of tartarized antimony, administered at intervals during a period of four months, presents us with the results of an analysis *four days* after the withdrawal of the antimony. The metal was most abundantly found in the liver, spleen, kidneys, urine, and fæces. The quantity was very small in the heart, lungs, and rectum. It was *not present* in the stomach or contents. There were traces in the blood. The other parts of the body were not examined for it. In a case reported by Dr. Haldane, in which a man had taken, for the treatment of pneumonia, from forty to fifty grains of tartarized antimony, death took place on the fourth day. A considerable quantity of antimony was found in the liver, and there was antimony in the affected lung, but less than in the liver.[5]

[1] 'Ann. d'Hygiène,' 1846, i, p. 155.

[2] 'Journal de Chimie Médicale,' 1853, p. 358.

[3] Casper's 'Leïchen Oeffnungen,' 1853, part ii, p. 156.

[4] Liverpool Assizes, 1856.

[5] 'Edinburgh Monthly Journal,' August, 1854, p. 184.

Among cases which have occurred to myself, I have found traces of antimony in the liver, when death had taken place in about fourteen hours after a dose of three grains of antimonial powder had been taken.[1] In February, 1853, a case was referred to me by Mr. Wakley, in which a man died twenty-four hours after he had taken three grains of tartar emetic in solution. No trace of antimony was found in the stomach, intestines, or their contents. In 1856, I made a a complete examination of the whole of the viscera of a man who five weeks before his death had taken a solution of tartar emetic in ordinary medicinal doses. No part of the viscera gave the slightest trace of antimony. In 1857, a similar investigation was made of the body of a female, who had taken, within three days of her death, four grains of James's (antimonial) powder and two grains of tartar emetic in solution. Antimony was found in the small and large intestines, but there was no satisfactory evidence of it in the liver or other viscera. In a case in which I was consulted, in March, 1857, a gentleman died two hours after three quarters of a grain of tartar emetic had been administered to him in solution. The viscera generally were carefully examined by MM. Tardieu and Lassaigne with the result that they found therein no trace of antimony or of any other mineral poison.

In April, 1857, a physician in this metropolis died under somewhat suspicious circumstances. In about two hours after his dinner he was seized with distension, pain in the abdomen, and vomiting. The bowels were constipated, the vomiting and pain continued throughout his illness, which terminated fatally on the fourteenth day. The stomach was so irritable that nothing could be retained on it. The vomited matters were of a yellow or greenish colour. After death the intestines were found highly inflamed externally and internally. It was suspected that poison might have been administered to him on the day of his illness. The viscera were brought to me for analysis; antimony was found in the stomach and intestines, but there was no trace of it in one of the kidneys. Dr. Marcet, who examined the liver, detected no trace of it in that organ. It was found on inquiry that three grains of tartar emetic in powder were given to the deceased six

[1] 'Guy's Hospital Reports,' Vol. VII, part i, Case xix, May, 1850.

days before he died. Thus, then, in this instance, the antimonial medicine had not entirely quitted the alimentary canal. It was impossible to ascribe its presence here to elimination from the mucous surface, because there was no evidence of any deposit in those organs in which it is commonly found. The symptoms from which deceased suffered, and the appearances taken as a whole, were unlike those of antimonial poisoning, and the presence of the metal was satisfactorily accounted for by its having been prescribed medicinally.

Taking these results generally, it would appear that antimony given in a large dose, or repeatedly in small doses, is rapidly absorbed and eliminated chiefly by the urine. It is at the same time deposited in greater or less quantity in the tissues and organs. That under recent administration, if in sufficient quantity, it may be found in the stomach and bowels, and little or none may be present in the liver; that after a variable time it disappears from the stomach and bowels, although it may be present in the fæces, while the liver, kidneys, and spleen, may contain it in large, and the other organs in small quantity. That some weeks or even months after its introduction (in animals), the metal if not entirely eliminated, may be found chiefly deposited in the fat and bones; the liver, fæces, and urine, may also contain traces until a late period. With regard to its presence in the blood in the human subject, slight traces of it were found in M'Mullen's case, four days after the cessation of the antimony, and in M. Marchal's case, after eight days. On the whole, the blood appears to retain the metal in smaller quantity, and for a shorter period than the other fluids and solids. In certain diseased states of the system, the complete elimination of the metal may require a period of twenty-five or thirty days or longer, and antimony may therefore in some instances be found in the liver and urine at this date; but in a healthy subject, to whom only ordinary medicinal doses have been given, the antimony is quickly expelled. In accordance with Orfila's experiments, there is no reason to believe that it would remain longer than fifteen or twenty days after the last administration in organs important to life.

In the case of Cook (who died from strychnia administered to him by William Palmer), Dr. Rees and I found antimony in

the *blood,* in the coats of the stomach, in the intestines, in the liver, the left kidney, and the spleen. With a knowledge of the facts regarding absorption and elimination, already related, before us, we affirmed that this extensive diffusion and deposition of antimony in the body of the deceased was only reconcilable with the view that it was of *recent,* and not of old introduction; and that some portion at least had been taken within a few days of death, and probably within a fortnight of his death. The presence of the metal in the stomach and intestines, as well as in the blood, was inconsistent with the view that the antimony could have been in the body of the deceased for months or years. The whole quantity found, was estimated at half a grain. We had clearly ascertained that antimony had not been prescribed by any medical practitioner in attendance on the deceased.

On these points, the following questions were put to me by Sergeant Shee, in cross-examination at the trial:

"Q. Have you not told me to-day that the quantity of antimony that you found in Cook's body, was not sufficient to account for death? A. Perfectly so: but what was found in Cook's body was not all that he took: if a man takes antimony—— Q. Do you wish to add to your testimony? I do; because I see it is only a little misunderstanding: if a man takes antimony, it produces this effect; first he vomits, by which some passes out of the body; some may escape by the bowels; there is a great deal that passes off at once by absorption, and is carried out by the urine. I find by the experiments of Orfila, whom we are all inclined to rely upon, that in from four to seventeen hours, antimony is found to be passing out by the urine. Q. Do you mean, on your oath,[1] to say from such traces of antimony as you found in Cook's body, you were justified in stating your opinion that his death may have been caused by antimony? A. Positively and decidedly so; the amount found in his dead body, is not the slightest criterion of what he may have swallowed while living.[2] I have sometimes found in a body less arsenic than would account for death. Q. But if the amount found is not the slightest criterion of what may have been administered, how does that justify you, as an analytical chemist, in stating

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[1] I was then stating upon oath, and without that "mental reservation" which the Sergeant's mode of putting the question implied, the scientific facts as they were within my knowledge. In a desperate defence, and where the struggle is against truth, a medical witness must be prepared for a covert attack of this kind. The sole object of counsel, in certain cases, is not truth, but victory at any cost. It is part of the "considerable scope" which is allowed to counsel engaged in a defence.

[2] A man has recently been convicted and executed at Lancaster, for poisoning his wife with tartarized antimony. The quantity found in her body was from half to three quarters of a grain! (See Case of Hardman, *post.*)

your opinion that so small a quantity may have caused death? A. I have not said what quantity may have caused death. I have said a certain quantity was found in the body, which may have been the residue of what had caused death,"[1]

The fallacies connected with this line of examination must be apparent, from what has been stated in a preceding page (*ante*, page 431). In no death from antimony yet recorded, has such a quantity of the poison been found in the body as would suffice to kill another person. When given in divided doses, as the evidence rendered it probable that it had been given in the case of Cook, and there has been violent vomiting in the intervals, it is not in the nature of things that small doses should accumulate and remain in the stomach and intestines for a week! Such questions, therefore, are only calculated to conceal the truth, and mislead a jury. Let it once go forth to the public, with respect to this, and of course, to all other poisons, that unless a chemist extracts from a dead body, that very indefinite quantity—"a fatal dose"—the medical inference of death from poison cannot be legally received, and the result will be, that murder by poison may be perpetrated with impunity.

The period of elimination of antimony from the living body, also gave rise to a series of questions in this case. After having quoted as Orfila's experiments, experiments which Orfila had not performed, but which he quotes from other authorities, the learned counsel drew from them an inference, with a view of defeating our conclusion respecting the administration of antimony to Cook recently before his death. These experiments are elsewhere quoted (*ante*, page 435). My attention having been called to the statements of MM. Millon and Laveran, that after the cessation of the administration of antimony for a period of *three and a half and four months* (see Experiments 4 and 5, *ante*, page 435), the liver contained "some" of it (antimony)—the facts that the antimony was chiefly accumulated in the bones and fat of the animal, and was *not* present in *the stomach, intestines*, or *blood*, having been carefully suppressed by the learned counsel—I was called upon to reconcile these half-quoted results with the opinion given by Dr. Rees and myself. Fortunately, I was sufficiently ac-

[1] The Queen *v.* Palmer. 'Report of Trial,' p. 143.

quainted with the works of Orfila to perceive that there had been both a mis-statement and a suppression of facts. They were not Orfila's results at all; and only so much of them had been quoted, as might appear to conflict with our evidence.

1. As much as *forty-five grains* of antimony had been given in divided doses, over a period of eight or ten days, to dogs. Assuming that elimination goes on at the same rate in a dog and a man, and that the relative difference in the size and weight of the bodies, as well as the absolute quantity of antimony taken, exercises no influence whatever on the amount diffused and retained by the organs, we had expressed no opinion on the quantity actually given to Cook. It might have been one tenth part of the quantity given to the dogs.

2. Dr. Rees and I had clearly detected antimony in the *stomach, intestines,* and *blood* of Cook, as well as in the liver, &c. On these important facts, we felt justified in basing our opinion of recent administration.[1] The learned counsel, with the book before him, well knew or ought to have known that antimony had *not* been found in these canine experiments in the stomach, intestines, and blood, and the results, therefore, in this respect, admitted of no honest comparison.

3. We could not even surrender the liver, in Cook's case, as an instance of remote administration. We found the liver of Cook firm and healthy; it had in no respect whatever undergone that change which is stated to have been produced by the long continued use of antimony in large doses (see *ante,* page 423). MM. Millon and Laveran, more than ten years ago, had pointed out this as one of the remarkable results of their experiments (*ante,* page 423). This fact, however, was suppressed, because, probably, it would have interfered with the application of the canine experiments to the results obtained by Dr. Rees and myself from our examination of the body of Cook.

No one who peruses the evidence given at the trial, can doubt that Cook was dosed with tartarized antimony before he was poisoned by strychnia. This dosing is proved by the symptoms to have begun on the 14th of November; and

[1] Imbibition was out of the question, as death was quite recent; and elimination by the stomach was inadmissible, as there was no suggestion that tartarized antimony had been injected into the blood, or thrust in the solid state into a wound.

there is reason to believe, that it was continued up to within forty-eight hours of death. The antimonial poison did not act with sufficient speed and certainty, and within twenty-six hours of death, the first dose of strychnia was substituted for it. Our opinion, therefore, that the deceased had had antimony within a fortnight, and probably within a few days, of his death, was fully confirmed by the medical and general evidence given at the trial.

In allowing that which a learned judge has designated a "considerable scope" to a defence, it may be a serious question whether, under this head, should be included the *suppressio veri* and the *suggestio falsi* in the misstatements of experiments and misquotation of authorities. If a medical authority is quoted on a question of science to support a certain view, the *whole* of his results bearing on the particular question should be taken together. It may happen that a medical witness under examination, is not well acquainted with the work quoted, and by this mode of dealing, therefore, his opinion, although well founded, may be easily made to appear inaccurate.[1]

8. Cases of Imputed Poisoning by Tartarized Antimony.

Poisoning by tartarized antimony may be wrongly imputed, and the reputation of a medical practitioner may be seriously involved in the inquiry. One object of this paper has been to show that we are not justified in imputing wilful poisoning by this substance, merely because there is proof that it has been taken, and that it has been found by chemical analysis in the organs of the body. It may have been prescribed *bonâ fide*, and death may have arisen from some other cause.

[1] From some experience in these matters, I would advise a medical witness not on any account to assent to an opinion or experiment quoted from a book, until he has had an opportunity of examining and reading the quotation. This will always be conceded to him by the Court. Statements in my work on 'Medical Jurisprudence,' have been quoted as adverse to an expressed opinion. On two occasions of this kind, I found, in one instance, that a learned counsel, and in the other, a solicitor, had stopped at a comma! I need hardly inform the reader, that the last clause of the sentence (suppressed) considerably modified the first clause, which alone it had been found convenient to quote!

Such cases demand careful investigation in all their medical circumstances, or irreparable injury may be done. Antimonial preparations are frequently prescribed and used as medicines, and it is by no means uncommon to find antimony in a dead body, as the result of such administration.

In 1847, I was consulted in a case involving medical responsibility, in which it was alleged that a child labouring under disease of the lungs had been killed by an overdose of tartarized antimony. The child took two doses of a common antimonial mixture, each dose containing, as I found by a quantitative analysis, only one quarter of a grain. There was a sudden access of pain after taking the medicine, but no vomiting, purging, or any other symptom to lead to the suspicion that the medicine had destroyed life. There was no sign of collapse. The child died twenty-four hours after the last dose. An opinion was given, that half a grain in divided doses had not killed the child under the circumstances. Death was assigned to natural causes. In fact, no effects indicative of a noxious action were produced by the medicine, and in the absence of such effects, it would have been improper to have assigned death to antimonial poisoning.

Another case, in which a similar question arose on the poisoning of an adult by a small dose, was referred to me for examination by Mr. Wakley, in February, 1853. The question was here more difficult, and gave rise to a difference of opinion. The deceased, a man of middle age, had suffered for three or four years from asthma and cough, and had been very ill three weeks before his death. The chief symptoms were pain in the chest and difficulty of breathing. He was attended by two medical practitioners, who did not meet in consultation, and appeared to take different views of his case.

One of these having found that emetics had given relief in former attacks, prescribed for deceased, on the 9th of February, an emetic of sulphate of zinc and ipecacuanha. As this had no effect, antimonial wine was prescribed, and a wine-glass, divided into two equal doses, was given at an interval of ten minutes. There was then only slight vomiting as a result of the throat being irritated by a feather. It appears that chloroform vapour had been administered to him for the relief of pain before the emetics were taken, and chloric ether had been

prescribed. The antimonial wine was taken about 4 o'clock p.m. At 5 o'clock, the patient was seen by the medical gentleman who did not prescribe the antimony, and he then found him much worse and in a state of collapse. He was again seen at 9 o'clock, and was found to be better; his pulse was improved. He had three liquid motions during the night. This gentleman did not see him again until the following day (the 10th), shortly before his death, at 2·15 p.m. His appetite was then so far restored that he asked for food, and sat up to eat it, when he suddenly died. An inspection was made by Mr. Fergusson, who found slight congestion of the right lung, and the bronchial tubes in both lungs were filled with mucus. The stomach and duodenum, with the contents of the stomach and small intestines, were delivered to me for analysis. There was slight redness of the mucous membrane in its middle portion, and congestion of the vessels of the stomach at its cardiac end, with minute ecchymoses—the membrane around being pale. The greater part of the surface was smooth, pale, and covered with a thin mucus. There was no appearance of inflammation, ulceration, softening, gangrene, or other disease. The duodenum presented no remarkable appearance. The stomach contained five ounces of a gruelly-looking liquid, unmixed with blood or any undue amount of mucus. Digested animal food (muscular fibre) was found therein. The contents of the intestines were similar; they presented nothing unnatural. On analysis, not the slightest trace of antimony was found in the contents or tissues of the stomach and intestines. Considering—1, that the symptoms on the day preceding death might have been due to the disease under which the man was labouring, as he was very ill on the Wednesday morning, before he had taken any antimonial medicine; 2, that there were no symptoms on the Thursday morning, the day of death, which could be specially referred to antimonial poisoning; 3, that he asked for food, and was eating it at the time of death; and, 4, that no antimony was found in the stomach, intestines, or their contents—Mr. Fergusson and I came to the conclusion that there was nothing to justify us in giving an opinion that he had died from three grains of tartarized antimony, taken twenty hours before death. As no antimony was found in the body, and the medi-

cine was taken in a liquid state, it is probable that the greater part had been ejected by the vomiting which followed. At the same time, it was a question whether the antimony had not accelerated death from disease. We felt that this was a question to which only a speculative answer could be returned. It appeared probable that the death of the man was owing to exhaustion, resulting in sudden syncope, in the act of sitting up; and the fact that he had asked for food, and had sat up to eat it, was adverse to the view that he was then dying from the effects of antimony. In short, it appeared to us that he might have died at the same time, and under the same circumstances, had no antimony been administered to him. The verdict of the jury was in accordance with this view. The medical gentleman who did not prescribe the antimony thought that by its depressing effects it had accelerated death; but, as he had seen deceased three times after the antimony had been administered, and had done nothing to support his strength or produce reaction during the twenty hours that he lived, the jury did not adopt this view; and the fact that the patient was not beyond the reach of such aid, was shown by his having taken food after his medical attendant had left him.

The administration of three grains of tartarized antimony to a person whose system is already lowered by protracted disease, would be at all times a dangerous procedure. At the same time, it is not justifiable to refer death to the medicine, unless the symptoms and appearances in the body, in addition to the detection of antimony in the organs, are such as to leave no reasonable doubt on the mind. When a person is already labouring under severe disease, scrupulous care is required in drawing a distinction between the natural effects of disease and the effects of the remedies administered.

A question of a somewhat similar kind, involving the reputation of a medical practitioner, was referred to me in March, 1857. A gentleman, addicted to habits of drinking, and suffering occasionally from attacks of epilepsy and delirium tremens, met with an accident in Paris, by falling from a carriage on his face and hands. He was taken up in a state of insensibility, but recovered on reaching home, and remained well the following day (Monday). On the Tuesday he was attacked with a fit of epilepsy; on the Wednesday, Thursday,

and Friday, he suffered from delirium tremens in a violent form. He died on the Friday, at 12·30. His violence was so great during the latter part of his illness, that he had been placed in a straight-waistcoat on the day before his death. On the Friday morning he was seen by an English physician who had been in the habit of attending him on previous occasions, and who had prescribed for his epileptic seizures, small doses of tartarized antimony, as he stated, with benefit. At 10 o'clock on Friday morning, *i. e.*, two and a half hours before death, while deceased was thus confined, and lying in a semi-conscious state, this physician prescribed and administered to him a white powder, which he said consisted of *three quarters of a grain* of tartarized antimony, mixed with a little sugar. According to the evidence, no effects followed, although it is stated by the other medical man in attendance that deceased vomited once. The physician who administered the powder was charged with poisoning his patient; the body was inspected, and the stomach and other viscera were removed for an analysis which was subsequently made by MM. Tardieu and Lassaigne. The principal morbid appearance was a large effusion of serum, tinged with blood, between the membranes of the brain, with general congestion of the brain. This had no doubt been produced as a secondary result of the fall, and it was quite sufficient, in the opinion of the examiners, to account for death. No antimony was found in the organs or tissues, but only a preparation of zinc, which had been used in the form of chloride, for the purpose of embalming the body. The analysis, however, was found to be incomplete, for although one of the examiners saw the stomach removed from the body, and placed in a jar, and properly sealed and labelled, yet when the jar was opened the stomach was no longer there. Some one had stolen it, or had taken an opportunity, unperceived by the examiners, of replacing it in the body.[1] This was an unfortunate circumstance for the English physician. He was charged with having administered

[1] This should convey a caution to medical practitioners in removing viscera for analysis. At any medico-legal examination of a body, only those required to make it and report on it, should be present. The admission of spectators, or of persons who (unknown to the examiners) may have an interest in removing or cutting to pieces the stomach for the purpose of destroying evidence, is a reprehensible practice. Palmer's case furnishes a good example of this.

from his waistcoat pocket a dose of poison, and the evidence of its composition then rested only on his statement. As the powder had been administered so recently before death, the stomach was the only organ in which it would probably have been found. The removal of it, therefore, left it open to be suggested that strychnia or morphia might have been given, or a much larger dose of tartarized antimony than three quarters of a grain. I examined a portion of that which was said to be the same sample of powder, and found it to consist entirely of tartarized antimony.

Wilful poisoning was imputed. Two actions for libel were brought by the physician, and one of the questions to be solved was—Did the dose of antimony admitted to have been given by the English physician actually cause death, or accelerate death from epilepsy, or delirium tremens supervening on an accident to the head? The answer returned was in the negative. The dose administered was small; no ill effects followed the administration, for the single act of vomiting, deposed to by one witness, was denied by others who were present. There was no evidence of depression of the pulse; no collapse; and, in fact, no proof of any change in the character or course of the symptoms as they were observed in the morning before and after the administration of the powder. The condition of the body showed no indication of poisoning by antimony, and, in the opinion of Mr. Partridge, of King's College, and myself, the conclusion of the French medical reporters was correct, namely, that the state of the brain, taken in connection with the accident, most satisfactorily and completely accounted for death. This loss of the stomach might have created a difficulty, had not the other circumstances furnished sufficient proof that the charge of poisoning was wrongly imputed. One of the actions was referred; and, on the trial of the other,[1] the physician recovered a verdict, with damages. The imputation on the English physician was scandalous, unjust, and untrue. The question whether it was proper to give a dose of three quarters of a grain of tartarized antimony to a patient situated like the deceased, did not arise. Physicians and surgeons are allowed by law a freedom of opinion

[1] Jones *v.* Young, Kingston Lent Assizes, 1857; and Jones *v.* Hales, Common Pleas, July, 1857.

on the remedies and doses which they employ: it is only where, in the prescription and administration, injury is produced by gross carelessness and unskilfulness, that a medical man will be held responsible for the result. If there were any other rule on this subject, how many physicians of the Rasorian school might not immediately be put upon their trials for killing their patients by administering to them enormous doses of antimony; thus acting contrary to the views of a large number of practitioners.

9. Cases illustrative of the Criminal administration of Antimony.

Medical History of the Case of Ann Palmer.

The deceased was twenty-seven years of age, and, although not of strong constitution, had generally enjoyed good health. In the summer of 1854, she had been examined by Dr. Knight, of Stafford, for a life-assurance office, and he then found her perfectly healthy: she had no disease.

Monday, September 18th, 1854. The deceased, being in her usual state of health, went with her sister-in-law on a pleasure-excursion from Rugeley to Liverpool.

Tuesday, Sept. 19th.—She remained at Liverpool with her sister-in-law, who was in her company the whole of the time. On Tuesday evening she attended a concert: she was thinly clad, said she felt tired on returning home, and complained of having caught cold. She retired to rest as usual.

Wednesday, Sept. 20th.—The deceased, on the afternoon of this day, returned with her companion to Rugeley. She and her companion had cold beef for their luncheon at Liverpool at twelve o'clock. The journey occupied from one o'clock until about half-past five in the afternoon; they had no refreshment of any kind during the journey. Nearly six hours had then elapsed; and up to that time it clearly appeared from the evidence of the sister-in-law, that the deceased lady had complained of no sickness, pain, or other symptoms of illness. She had not vomited, and there had been no purging. When she arrived at Rugeley, she walked home from the station. One witness, who walked with her part of the way, stated that she complained of feeling sick; but as he left her to find her way home without his assistance, it is evident that there could have been nothing in her condition at that time to excite particular attention. She reached her house on foot between five and six o'clock, and was admitted by the female servant (the only servant in their establishment.) She was well able to walk, and complained of no illness. The servant prepared some tea for her, which the deceased took: deceased went to bed at 9·30, and so far as the servant knew, she was not sick or ill during that night. Palmer had been out the whole of the day, and returned home about nine o'clock in the evening.

Thursday, Sept. 21st.—The servant prepared breakfast (tea, &c.), for deceased as usual, but it was taken to her by Palmer. She prepared only tea and gruel for her

during her illness, excepting on one occasion, when, at deceased's request, she prepared a little arrow-root and sago: the food prepared by the servant was always taken to deceased by Palmer. The servant gave neither food nor medicine to deceased on this or any other occasion during her illness. No one was in the house at this time, excepting the female servant, deceased, and Palmer. Up to Monday, the 25th, Palmer occupied the same room with his wife. The female servant first knew that deceased had been sick (had vomited) between ten and twelve o'clock on this day. She emptied the vessels. The vomited matter was at first in small quantity, white, and had a watery appearance. According to her statement, there was no purging until a day or two after deceased had returned from Liverpool. No one attended on the deceased on this day but Palmer and the servant. The servant saw the deceased four times: she continued sick all day at intervals, but she was not heard to complain of any particular pain. She had no knowledge that deceased had taken any medicine, and she saw no medicine until after Mr. Bamford had been called in to see her on the Sunday following.

Friday, Sept. 22d.—The deceased continued in much the same state. The servant saw no medicine in Mrs. Palmer's room. No one but the servant and Palmer attended on her this day.

Saturday, Sept. 23d.—The deceased continued ill, and kept her bed. According to the statement of the sister-in-law, who saw her, deceased complained of a pain in her stomach and chest: she felt sore in her chest, and ill all over. She appeared very ill.

Sunday, Sept. 24th.—Deceased was seen by Mr. Bamford in bed. She was in such a state of debility that it appeared painful to her to return an answer to a question. At the time of his visit she complained of a great deal of nausea, but she was not actually sick in his presence, and she was not purged. He was informed by Palmer that her bowels had not been moved for twelve or fourteen hours before he saw her. He prescribed two aperient pills, consisting of one grain of calomel and two and a half grains of colocynth in each, and an aperient draught containing tartrate of potash, powdered rhubarb, mint water, and aromatic spirits of ammonia. He advised an injection. Six pills were afterwards ordered (one half grain of calomel and two and a half grains of colocynth in each), one to be taken every three or four hours until the bowels were opened. (These were not taken.) The draught which was taken was immediately rejected. In spite of the aperient medicines, he was informed that nothing had passed through the bowels. He considered the deceased to be then sinking: she was much exhausted. There were no symptoms of bilious cholera when he saw her. The prominent symptoms were nausea, great debility, and constipation of the bowels. Palmer informed him that deceased had vomited, and had been purged: but she had since been constipated for two days. He did not prescribe tartar emetic; and, considering the condition deceased was in, he would not have prescribed it. Such a medicine would have been improper. He advised that Dr. Knight should be sent for and consulted. (Dr. Knight is a physician of Stafford, and was guardian to the deceased.)

Monday, Sept. 25th.—Deceased was seen by Dr. Knight about three o'clock, p.m. Dr. Knight found her in a very weak and dangerous state. Was told by Palmer that she had got an attack of English cholera at Liverpool, and had come home ill. She vomited incessantly, and could retain nothing on her stomach. Palmer informed him, in the presence of his wife, that she had had distressing vomiting,

griping, and purging. She did not vomit in his presence, but the retching was severe. Asked to see the evacuations, but was told they had been thrown away. As far as he could then form a judgment from the information given to him by Palmer (a medical man), he thought she was suffering from a severe form of English cholera: he considered the deceased to be then sinking, the prominent symptom being extreme exhaustion. She was unable from weakness to answer questions: she spoke in a whisper. He prescribed prussic acid, saline draughts, and an opiate solution. There was no antimony in any of the medicines which he prescribed. He would not have prescribed tartarized antimony, because it produces great depression of the vital powers, and would have aggravated the symptoms. He took his leave, with an assurance from Palmer, that, if deceased did not improve, he should be again sent for. He was not sent for, but he heard on the following Saturday that she was dead.

A nurse (Bradshaw) came to her on the evening of this day, and remained with her until her death. Soon after Dr. Knight left, the sickness returned. Deceased did not complain of pain, but chiefly of the sickness which exhausted her. There was *no purging*, while she was with deceased, except on the morning on which she died. She was very weak and low. She was sick three and four times in the day after she had taken anything. The matter which she vomited was of a yellowish colour, and appeared like bile,—it was watery, not so thick as gruel. She vomited shortly after taking food, sometimes the quantity amounted to as much as a quarter of a pint. Deceased had no solid food while witness was with her. She said she could not take anything. She said her throat felt sore, and she thought that she had strained it by vomiting: she complained of her mouth being dry at times, but she was not particularly thirsty. During the time she was with her, she took only two pills and a mixture, besides some effervescing draughts given to her by Palmer. She had no injection while she was with her. Palmer himself made broth for deceased during her illness.

Tuesday, Sept. 26th.—Seen by Bamford [Bamford's statement] in the morning. She then refused all sustenance, and appeared to be sinking fast. This was the last time he saw her alive. She was seen dozing on this day by her sister-in-law, but she did not again see her alive.

Wednesday, Sept. 27th.—The only knowledge of her condition on this day is that obtained from the evidence of Bradshaw as described above. No medical man saw her or was called to her.

Thursday, Sept. 28th.—Seen by Thirlby, a druggist, on this day. He acted as assistant to Palmer. She was in a frightfully exhausted state, and said she felt as if she should sink through the bed. She was so weak that it was difficult to get her to answer questions. The nurse informed Palmer, that deceased's bowels had not been moved, and he said he thought it was better for her as she took no support.

Friday, Sept. 29th.—Her bowels were moved for the first time since Monday. She was purged several times, and this continued up to her death, about one o'clock on this day. As soon as her bowels were moved, the sickness abated: she survived only three or four hours. She died in a composed manner, quite low and exhausted: there was no spasm or fit, and she was sensible to the last. No particular observation was made as to her breathing. The nurse was alone with her when she died. Palmer had been frequently in and out of the room that morning. The

last thing deceased took was a little grape juice, about three hours before she died.[1] This probably brought on the purging.

The body of deceased was laid out about an hour after death, by the nurse and a woman who assisted her. It presented no peculiar appearance. The limbs were not stiff until she was cold.

[There are entries in Palmer's 'Diary,' representing that the deceased was "ill in bed" from Sept. 21st to Sept. 25th, after which date there are daily entries until the day of her death, to the effect that she was "very ill in bed."]

Founding their opinions on the information given to them by Palmer, and trusting implicitly to his statements respecting the symptoms, and the nature of the illness of the deceased, the two medical gentlemen, who had each seen the deceased once, gave certificates of the cause of death. Mr. Bamford's certificate to the registrar (for the burial of deceased) was as follows:

"I hereby certify that I attended Ann Palmer, aged 27 years last birthday, that I last saw her on the 29th September, 1854, that she died on the 29th Sept., and that the cause of death was—

Cause of death.	*Duration of illness.*
Choleraic.	One week.

(Signed) W. Bamford."

It is clear from the entries in Palmer's 'Diary,' as well as from the other evidence, that this gentleman saw deceased only *once* during her severe illness, namely, on Sunday, September 24th; and at that time there were no symptoms about her indicative of bilious or summer cholera. Her bowels were constipated, and she was suffering from nausea and great debility. He did not see her again *alive*. The entry in the certificate, therefore, to the effect that he last saw her on the 29th of September, must imply that he saw her dead body. Such a certificate was valueless for the accurate registration of the cause of death, and it cannot in the slightest degree affect the inference that the deceased died from poison.

It is obvious that some change is required in the form of this certificate if we wish to prevent the concealment of murder by poison. As in certifying to the state of insanity of a person, the period of attendance, and the number of visits made, should be more clearly described; and in assigning a cause of death, it should appear whether the medical opinion is based on facts observed by the practitioner, or on *facts communicated to him by others*,—the information, as well as the name of the informant being given.

The certificate of Dr. Knight to the Life Assurance Company, was as follows: "I certify that I attended Mrs. Ann Palmer, of Rugeley, who died on the 29th Sept., for the term of one visit, on Sept. 25th, immediately previous to her decease, and that her disorder appeared to me to be English cholera of the most dangerous kind, caused by a recent visit to Liverpool."

Dr. Knight here states distinctly that he saw the deceased only *once*, and gives the date when he saw her living, as well as the date of her death. It will be seen by the evidence which he gave at the adjourned inquest, that his opinion of the

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[1] Memoranda from notes of the evidence taken by me at the inquest on the 13th and 14th January, 1856.

cause of death was not based on what he saw, but on the information given to him by Palmer.

In consequence of the certificate given by Mr. Bamford, the deceased was buried on Tuesday, October 3d, 1854, four days after death. No suspicion was then entertained, and no examination of the body was made. After the lapse of *fifteen months*, namely, on the 22d December, 1855, the body of the deceased was exhumed under legal authority, and carefully inspected by Dr. D. H. Monckton, of Rugeley. The following is the substance of his report:

Appearances of the Body.

When the coffin was opened, the general appearance presented by the body was that of a mummy. The upper part, including the arms and hands, was dry and dusty on the surface, apparently from the decay of the grave-clothes, while it was in state of moist decomposition beneath. The hair was plentiful, long, and thick, of a light brown colour; the cuticle had not separated, and it was not moveable under the finger. In opening the chest and abdomen, the muscular layers presented a natural appearance, and the internal organs were so free from decomposition that they appeared in the state in which they are found in bodies that have been only a few weeks in the dissecting room.

The *lungs* were slightly emphysematous; collapsed; dark-coloured, and nearly covered in the thorax by a large quantity of bloody fluid collected in each pleural cavity; they seemed saturated with this fluid. There were no adhesions of the lung to the walls of chest; no consolidation; no tubercular deposit or cavity in the left lung.

The right lung was reserved for analysis. Frothy fluid exuded on section of the lung-substance.

It was noticed that adipocere was deposited on the upper surface of the diaphragm and on the lungs at places, but only above the level of the fluid in the thorax.

The *heart* was empty and collapsed; its walls exceedingly thin and membranous; a considerable quantity of fat coated the outside of the heart, being deposited along the line of the septa.

There was some fat in the omentum, but little elsewhere.

The *liver* was of ordinary size and appearance. It was removed for analysis.

The *stomach* was to all appearance empty; it was removed unopened. The duodenum was also secured by ligatures, and left attached to the stomach.

A portion of the small intestines was secured and reserved for analysis. The remainder was carefully opened, cleansed, and examined in its whole length, and showed no evidence of disease of any kind either of the mucous membrane or other coats. There was a moderate quantity of digested food in them of the consistence of thick gruel, and mixed with a normal amount of bile.

The cæcum and rectum were secured and reserved for analysis. The remainder of the large intestines was opened, cleaned, and examined; they exhibited a perfectly normal appearance inside and out, and contained a quantity of a similar fluid to that found in the small gut, but rather thicker and more fæcal. The rectum contained no hardened fæces, but a large quantity of fæcal matter.

The bladder was collapsed and empty. The uterus was unimpregnated and healthy.

The *ovaries* were normal, and showed several corpora lutea; on one, a superficial

deposit was found, apparently a thin, osseous lamina, (deposits of earthy phosphates from decomposition.) This ovary was tied in a piece of bladder and reserved for analysis.

The *kidneys* showed no evidence of disease; one was reserved for analysis, and the other, when opened, appeared as healthy internally as it did externally.

The membranes of the *brain* were entire and normal; exsanguine; brain in a state of extreme decomposition, and thoroughly unfit for examination.

All the *blood* found in the body was that collected in the pleural cavities; little or none was found in the hollow or solid viscera.

The *spleen* was of the normal size and consistence. This was reserved for analysis.

On Monday, December 24th, 1855, the portions of the body of the deceased thus removed for analysis, were received by my colleague, Dr. Rees, and myself, at the chemical laboratory, Guy's Hospital.

Report of Analysis in the Case of Ann Palmer, deceased.

Three *jars* were delivered to us, sealed and otherwise well secured, and labelled "Ann Palmer."

No. 1, Contained the stomach and duodenum.
„ 2, Portions of the large and small intestines, and one kidney.
„ 3, The liver, spleen, heart, and right lung, and one of the ovaries.
„ 4, Part of the lining of the coffin.

No. 1. *Stomach.*—The coats were firm and well preserved, considering the length of interment. Externally, they presented nothing remarkable, except a slight reddish-yellow streak near the greater end. This had the appearance of mineral matter in the coats, such as might be produced by arsenic or antimony. When the stomach was opened, a highly offensive gas escaped. There were no liquid or solid contents; but a thin, pasty-looking substance, of a coffee-brown colour, was spread over the whole of the lining membrane. The whole quantity of this pasty matter was estimated at about half a tea-spoonful. The mucous coat presented slight patches of redness, but there was no ulceration, perforation, or organic disease of the stomach.

No. 2. *Large and Small Intestines.*—The *duodenum*, part of the *ileum*, *cæcum*, and *rectum*, or lower bowel, were examined. They presented no appearance of disease. The small intestines were empty, but covered on the inside with a thin, brownish-yellow coloured substance. The inner coat of the rectum was covered with a deep orange-red substance, closely adhering to it. On removing this, there was no appearance of ulceration on the surface, or of any disease. The intestines, like the stomach, were, comparatively speaking, well preserved, and the coats, though thin, were firm.

The *kidney* enclosed in this jar, was minutely examined, and found to be quite healthy.

No. 3. *The Liver, part of the Lungs, Heart, and Spleen.*—These organs were found to be in a healthy condition. They had undergone some changes as the result of putrefaction. The gall-bladder contained bile, which was thickened to the consistency of a brown paste. The cavities of the heart were empty; the valves were firm and free from disease. The lungs and spleen were softened from putrefaction, but they presented no appearance of disease. The whole of these viscera were in a remarkable state of preservation.

A *chemical analysis* was made of the following parts:

1. The brown, pasty *contents of the stomach* removed from the surface. They were found to contain, in rather large quantity, a preparation of *antimony*. A very minute portion of arsenic was also detected; but as arsenic was not found deposited in the viscera, and is said to be an occasional impurity in ordinary tartar emetic, we consider that the presence of this minute trace of arsenic in the stomach of the deceased, may have been owing to such impurity. There was no indication of the presence of any other poison.

2. The *coats* of the *stomach* were examined, and yielded antimony.

3. The large and small intestines (duodenum, ileum, and cæcum) were found to contain antimony.

4. The orange-red deposit on the *rectum* was removed and separately examined. Antimony was found in this in larger proportion than in the stomach or other parts of the body. The colour of the substance was found to be owing to the partial conversion of the mineral to sulphuret of antimony, as a result of putrefaction. The coats of the rectum also yielded antimony.

5. The thickened *bile* removed from the gall-bladder, and separately tested, yielded antimony in a proportion nearly as large as that found in the rectum.

6. About two ounces (*i. e.*, about one twentieth part) of the *liver* yielded antimony in well-marked quantity.

7. The spleen contained antimony, but in smaller proportion than the liver.

8. The *kidney* contained a small quantity of antimony.

9. Antimony was detected in the inner substance of the *heart*.

10. Antimony was also detected in the substance of the *lungs*, but in smaller proportion than in the other viscera.

11. The drainings of the jars 2 and 3, consisting chiefly of *blood*, were tested, and found to contain antimony.

12. A portion of the lining of the shell and part of the dress of deceased, was examined. It yielded no trace of antimony, or of any poison.

In this investigation, fifteen different analyses were made, occupying us from the 26th to the 31st of December, and the conclusions which we draw from the results are:

Conclusions.

1. That all parts of the body of deceased examined by us contained antimony. In the (contents of the) stomach and intestines, the antimony was partly in a soluble form (soluble in water), while in the liver, heart, spleen, kidney, and lungs, it had been deposited as a result of absorption during life.

2. The largest quantity of antimony was found in the rectum and its contents, next in the stomach and its contents, then in the bile taken from the gall-bladder, and the smallest quantity was found in the lungs. [We estimated that about one grain of antimony was contained in the duodenum and rectum, the greater portion being in the coloured substance on the surface of the rectum; that the contents of the stomach and its coats held three quarters of a grain; and that two grains were deposited in the liver and other viscera, the greater proportion being in the liver. There were, therefore, about four grains of antimony, more or less, in the portions of the body examined. The weight of animal matter employed in the analysis, might be taken at about seven pounds. The quantity diffused in other parts of the body not analysed, would of course add to the amount present at the time of death.]

3. The presence of antimony in the *contents* of the *rectum* proves that the *discharges* from the bowels of deceased contained antimony up to the *time of her death;* that she was passing antimony by purging when she died; and the presence of this mineral is sufficient to account for the vomiting or diarrhœa, or both, from which deceased is stated to have suffered during her last illness.

4. From the discovery of antimony in the *contents* of the *stomach*, we infer that a preparation of antimony must have been taken by deceased within a few hours of her death.

5. From the discovery of antimony in the stomach and intestines, especially in the rectum (as well as in the absorbed state in the other viscera), we infer that the antimonial compound, if not taken by deceased as the result of a series of accidents, was improperly administered to her either through ignorance or by design.

6. That in our opinion, the antimony found by us in the body of deceased, has not been the result of one large dose, but of several doses, taken at intervals some days before death, and to within a few hours of her death.

7. That the antimonial preparation taken by the deceased, was what is commonly called *tartar emetic* (tartarized antimony), and this may or may not have acted as a poison, according to circumstances.

8. It may or may not have been the direct cause of deceased's death. In the event of the existence of any natural cause for the illness of deceased, it may have accelerated her death, by producing great depression and exhaustion of the powers of life.

9. In the examination of the stomach, bowels, or other organs of deceased, we could not detect any changes as the result of natural disease. There was nothing to account for death. On the other hand, there was nothing in these appearances inconsistent with the death of the deceased from frequent doses of tartar emetic.[1]

ALFRED S. TAYLOR.
G. OWEN REES.

Chemical Laboratory, Guy's Hospital,
January 4, 1856.

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[1] A few additions in brackets have been made to the conclusions of this report, in order to explain a little more fully the results of our analysis, and the grounds for the inferences drawn. It may be observed in this place, that the glaze of the jars (white earthenware) was analysed, and it did not contain any antimony.

The processes of Reinsch and Marsh were used in this analysis, and both concurred in proving, in the most satisfactory and conclusive manner, the presence of antimony in all the parts examined. If the total amount of antimony separated by us from about one fifteenth part of the weight of the body, *i. e.*, four grains (and the remaining fourteen fifteenths were assumed to contain no antimony) would not be sufficient to prove fatal to another person, we still felt ourselves justified in drawing the conclusion that the small quantity might represent the residue of a larger dose or of several doses, which might have proved fatal to the deceased.[1]

A portion of the liver was analysed by carbonization with sulphuric acid, and the subsequent extraction of the antimony from the dry ash by nitro-hydrochloric acid. Chloride of antimony was thus procured, precipitable by water, and possessing the other chemical properties of that compound.

At a subsequent period the *ovary* was analysed, and this was found to yield a quantity of antimony equal to the fiftieth part of a grain.

On the 13th and 14th of January, 1856, Dr. Rees and I attended the adjourned inquest at Rugeley, in the case of Ann Palmer. I then handed to the coroner the report of our analysis, and having heard the evidence, gave the following additional testimony.

I have no reason to alter the conclusions I have drawn from the evidence I have heard. Had tartar emetic been substituted by Mr. Bamford for tartrate of potash, other and more serious symptoms would have suddenly shown themselves in deceased than those which I have heard described in evidence. It is my belief deceased had had tartar emetic, and was suffering from its effects, before Mr. Bamford saw her; that is to say, assuming he first saw her on Sunday, the 24th September, 1854. Tartar emetic would not be tasted in small doses, and would not be tasted if taken in articles of ordinary food. The killing of a person by antimony depends as much on the manner in which it is given, as on the quantity. Ten grains in one dose given to a child caused death. Antimony, in ordinary doses, does not produce constipation of the bowels generally. I should think this antimony was given to the deceased in (ordinary) medicinal doses. From the medical evidence as to the condition of

[1] See the case of Hardman, *post*.

deceased during the last eight days before her death, and from the discovery of antimony in the bowels, stomach, and all parts of the body, it is my opinion that she died from the effects of antimony, and not from any natural disease. I should think antimony (given fairly in ordinary medicinal doses) would disappear from the living body in about fifteen or twenty days after its withdrawal. The quantity of antimony found deposited in the viscera of the deceased (considered in relation to the symptoms), I believe was inconsistent with life (see 7th conclusion). That which gets (by absorption) into the blood and system destroys life, while the portion found in the stomach and bowels (unabsorbed) is the surplus of that which has destroyed life. Antimony is often given in small doses in cases of cold attended with fever. (It would not have been a proper medicine for the deceased in the condition in which she is described to have been.)

Dr. Rees corroborated this testimony, stating that he concurred in every statement respecting the analysis and the cause of death. He further said, "From the history of the illness of deceased, given by those who attended her, from the examination of the organs after death, and from the fact that antimony was discovered as described in our conjoint report, I am decidedly of opinion that the deceased died from the effects of antimony administered in small doses, and repeated at intervals."

Dr. Monckton, who conducted the inspection of the body, stated it to be his opinion, "that the appearances were not consistent with the deceased having died of English cholera, because English cholera, going to the extent of causing death by exhaustion, would have much more freely evacuated the intestinal canal. The deceased might have died from excessive vomitings causing exhaustion, but this would not be English cholera."

Dr. Knight, having been recalled, stated that the deceased had no symptoms of fever when he saw her. He formed his opinion of the cause of death from the description of her symptoms given to him by Palmer. After the evidence he had heard, he thought he was mistaken, and that the true cause of deceased's death had been stated by Dr. Taylor and Dr. Rees. He now believed that the deceased was suffering from the effects of antimony when he saw her on the 25th September, 1854. The evidence of Dr. Monckton respecting the appearances in the body, led him to believe that the deceased did not die of cholera, as he had at first supposed. His

opinion now was that deceased did not die from vomiting produced by natural causes. An examination of the body and an analysis were sometimes necessary to determine the true cause of death. It was not always possible to form an accurate opinion of a case without a statement of symptoms by the patient. He obtained his information chiefly from Palmer, as he could not ascertain anything from Mrs. Palmer on account of her extreme exhaustion, and her inability to answer questions.

Mr. Miller, a surgeon, stated that he had examined the deceased in January and February, 1854, for the purpose of life-insurance, at least four times. She was of sound constitution, and he considered her a proper life for insurance. Having heard the description of the symptoms, of the appearances of the body, and the analysis, he thought death had been caused by small doses of antimony.

Upon this and other evidence of a general kind, the unanimous verdict of the jury was that, "Ann Palmer died from the effects of tartarized antimony, and that such antimony was designedly administered to her by her husband William Palmer."

There are two questions in this case, one medical and the other purely legal: 1. Did the deceased die from the effects of tartarized antimony? 2. If she did, was it taken by any accident, or administered to her by criminal design?

On the first question, the various facts connected with antimonial poisoning, will help the reader to a judgment. Apart from the consideration of the presence and extensive diffusion of antimony in the dead body, was there any natural disease to which the symptoms and appearances could be ascribed? To Dr. Rees and myself there appeared to be no disease which would explain all the medical facts of the case. Subsequently to the inquest, we were called upon to consider and reply to the following questions:

1. *Can the symptoms and appearances be referred to any natural causes?*

The prominent symptom, during the illness of deceased, from Thursday the 21st September, until her death on Friday,

the 29th, were nausea, retching, and vomiting; the latter occurring at intervals soon after taking soothing articles of food, such as tea, gruel, arrow-root, &c., and continuing more or less throughout the whole of her illness. The only two medical men who saw her, one on the fourth and the other on the fifth day after the commencement of her illness, found her affected with nausea, distressing retching, extreme debility, and complete exhaustion. There was *no purging*; on the contrary, when Bamford saw her on the 24th, her bowels were constipated, and from the time when deceased first fell under the care of the nurse on the 25th, the bowels were not moved until the 29th, the morning of her death, and this action was apparently produced by grape-juice.

All that can be learnt respecting the vomited matters is, that in the commencement of the illness they were white or watery, while in the latter part, they were yellow or coloured by bile. The deceased could retain nothing on her stomach, and took no solid food during the whole of her illness.

On inspection, all parts of the stomach and intestines were so well preserved, as to allow of an examination, and an opinion of their condition. There was no disease of the pylorus—no ulceration, scirrhous disease, or any morbid condition of the stomach, which could account for the violent symptoms. What led to the nausea, retching, and incessant vomiting, after taking every liquid article of food, of the blandest and most soothing kind, to the prostration of the vital powers—shown by the debility, pulselessness and loss of voice? She was sinking on the fourth day, and one of the medical men then thought that she could not recover. We knew no natural causes which could have produced symptoms of this severe and continuous kind, commencing so suddenly from a comparative state of health, in a woman in the prime of life, enjoying average health, and whose bodily condition had been only recently examined by a skilful physician, with a view to the insurance of her life, and approved as perfectly healthy. We could name no disease in the whole catalogue of nosology, which could have produced such a series of symptoms proving fatal in seven days, that would not have been indicated by some morbid or diseased condition of the stomach or other organs. Some of the symptoms might, it is true,

have been referred to *gastritis* or inflammation of the stomach; and it might have been suggested that traces of inflammation in this organ would not have been visible after so long an interment. I have, however, had an opportunity of seeing well-marked inflammation of the stomach from irritant poison, in a dead body after nineteen months' burial, where the viscera were all well preserved, as in this case. Assuming the proposition to be correct, there were other circumstances inconsistent with an attack of gastritis or gastro-enteritis. There was throughout an absence of pain in the stomach and tenderness in the abdomen. The vomitings were not attended with pain. There was also an absence of fever. Even supposing that there had been symptoms and appearances indicative of gastritis, it would have been still a question whether as this is one of the effects of tartarized antimony, and the mineral was found in the stomach and bowels, the gastritis was not really a result of the action of the poison. It is well known that idiopathic gastritis (from causes irrespective of poison) is very rarely seen.

As we had found in the fluids of the stomach and intestines from the duodenum to the rectum, in the liver, spleen, kidney, ovary, lungs, and heart, a preparation of antimony, it appeared to us only reasonable to refer the symptoms to the action of some antimonial compound taken during life. They were consistent with the action of antimony, but they were not consistent with any natural cause with which we were acquainted. It is very true that in drawing this inference some person might be implicated in a charge of having caused the death, but that could only be by acts or deeds on his or her part with which we had not to concern ourselves. The symptoms and the discovery of antimony in the stomach, were medical facts which stood in the relation of effect and cause, and no other reasonable cause for them could be assigned. To entirely ignore the presence of antimony in all the organs of the body, and to assign the symptoms to some new form of undiscoverable disease which had run its fatal course, and left no trace of its existence in the dead body, might suit the purposes of an ingenious defence; but it would have been inconsistent with the duty of those who were bound conscientiously to report on the medical and scientific facts of the case utterly regardless of consequences.

A second question which we were required to answer specially, although included in the preceding, was—

2. *Could the symptoms and death of the deceased be referred to a fatal attack of English Cholera?*

Palmer had informed Dr. Knight, on the 25th September, that deceased had "caught the cholera at Liverpool, and had come home ill." On Sunday, the 24th, the fourth day of her illness, he had informed Bamford, then first consulted, that her bowels had been constipated, and thus Bamford was led to prescribe purgative medicines. There does not appear to have been at an early period of her illness much purging, and certainly none for the last five days of her life. There was therefore an entire absence of that prominent symptom of English cholera, violent and frequent bilious purging. The bowels were not empty when the body was examined. In English cholera the vomited matters from the first assume a bilious character; here it was not until after the fifth day of her illness, that this condition was seen. In the early part they were whitish; there was frequent nausea with violent retching, and when the vomiting had taken place no tendency to relief or recovery, but a continued decline of strength. There was soreness of the throat with pain in the chest. All these conditions are consistent with antimonial poisoning, but they are not consistent with the ordinary course of English cholera.

Assuming, however, that deceased had laboured under bilious or English cholera of the most dangerous or severe kind, then the recent administration of tartarized antimony in a quantity sufficient to account for that which was found in the body, would, by causing nausea, vomiting, and extreme depression, tend to weaken her still more, and to render this or any lingering disease certainly fatal. The two medical men who attended her stated that they did not prescribe this drug, and on no account would they have prescribed it for a patient in her condition.

Under some vague idea that the symptoms during the fatal illness might have been due to pregnancy, an application was made to Lord Campbell that the ovary, which had been preserved by us should be examined by two distinguished physicians, for the purpose of solving this question. Dr. Copland

and Dr. Carpenter were appointed for this purpose. This was in May, 1857 : twenty months after death, and five months after the disinterment of the body and exposure of the remains. The ovary was scarcely recognisable. Had corpora lutea been then visible upon it, as described by Dr. Monckton in his report, this could not have reasonably accounted for any of the symptoms under which the diseased laboured. Dr. Monckton, indeed, had expressly stated that, "the uterus was unimpregnated and healthy."

3. *Could the antimony found in the body be referred to the accumulation and deposit of this metal as a result of medicinal doses, taken at a period long preceding the last fatal illness?*

We were informed that, on the part of the defence, there was medical evidence to prove the affirmative of this proposition. Our reply was to the following effect :

Antimony could not have been taken in numerous medicinal doses, at intervals during the whole term of life, without producing symptoms such as nausea, vomiting, &c., of which there is no evidence prior to the day following deceased's arrival at Rugeley, namely, Thursday, September 21st, 1854.

Although persons may acquire what is called a "tolerance" for antimony in large doses, just as they acquire it for opium,[1] the deceased certainly did not manifest this state ; for, excepting the absence of purging, she died under symptoms such as antimony acting as a poison would produce, and antimony in a soluble form was found in the stomach after death.

Assuming that antimony had been taken in medicinal doses over the whole of life, and that it would have exerted no poisonous action although absorbed, there is no reason why the lungs, heart, kidney, and spleen, should not have been as much impregnated with the metal as the liver ; but this was not the case. This fact is explicable on the supposition of recent administration, since the metal would be deposited more

[1] The constipation from which deceased suffered was supposed by some to have been due to antimony ; but this state can hardly be assumed to indicate "tolerance" when nausea, vomiting, and depression continued in so severe a form. The continued constipation may have been owing to the astringent effect of the antimony, or to other and natural causes. There was simply an absence of purging as one of the symptoms of antimonial poisoning.

rapidly and abundantly in the liver than in the other organs.

The large quantity which existed in the bile or the gall-bladder, points to the rapid elimination of antimony by the liver. The liver of deceased was perfectly healthy. In animals, to which doses of tartarized antimony had been given at intervals (forty-six grains in divided doses during a period of ten days), and the animals had died, the one in fifteen and the other in twenty-one days, *poisoned* by the antimony, the liver was found very much enlarged, very brittle, and its weight increased threefold. This was the only appearance, and as it was found in both dogs, which were previously healthy, it is clear, if the observation be correct, that it presents a means of testing the question of the period of administration.

In the case of the deceased, the liver was perfectly healthy, it was not enlarged, not brittle, and had undergone no other changes than those which the liver of a healthy person would have undergone after the body had been buried fifteen months.

The absence of symptoms, the unequal distribution of antimony throughout the organs of the body, and the healthy state of the liver, are therefore adverse to the supposition that the antimony deposited in the soft organs, was the result of small doses given at intervals during the whole term of life. The presence of soluble antimony in the stomach, its diffusion through the whole of the bowels, its presence in the contents of the rectum, taken together with the symptoms preceding death, point to *recent administration*, and the quantity deposited in the soft organs, as well as the presence of antimony in the bile, are strictly in accordance with this view.

In fact, it must be obvious from that which has been elsewhere stated, respecting the elimination of antimony (*ante*, p. 443), that in no instance has it been proved that antimony could be retained in a soluble form in the contents of the *living* stomach for years, months, weeks, or even days. Assuming that the liver may retain it for a longer period than Orfila and Flaudin have found in their experiments (*i.e.* about fifteen days), it can hardly be suggested that the stomach, through which food and other liquids are continually passing—which is also liable to have its contents discharged by the act of

vomiting, can retain a soluble preparation of antimony for weeks or even days. As a fact, I have ascertained in the dead human body that not a trace could be found in the contents of the stomach, when three grains dissolved in liquid had been given only twenty hours previous to death. The presence of soluble antimony in the stomach of Ann Palmer, therefore, fixes the administration of at least a part of the poison recently before death. The quantity found in the liver and other organs, is also consistent with recent administration, while there is not a single fact in the life of the deceased to show that she had taken antimony at any antecedent period. The irrelevancy of the experiments on dogs by Millon and Laveran, quoted adversely to this conclusion (*ante*, p. 446), has been already pointed out. The contents of their stomachs held no antimony, while it was present in the stomach of deceased; the pathological and chemical facts were wholly different, and admitted of no comparison.

The theory of *gastric elimination*, to account for the presence of antimony in the stomach, is equally inadmissible. The antimony must have entered the body of deceased by some channel. No one has suggested that it was injected into a vein, or thrust into a wound in the skin. Hence it must have entered the body either by the stomach or the rectum. While it might pass from the stomach to the rectum, it is not likely that it would ascend from the rectum to the stomach; and there is no good reason to suppose that it was taken up by the absorbents from the contents of the rectum, and transported and deposited especially in the stomach. It is at any rate more probable that the antimony found there, reached that organ by the ordinary process of deglutition, and that it was not injected into the rectum at all. No injections were at any time administered to the deceased. Whether in addition to the portion which entered the stomach by the œsophagus, any other portion removed from that organ by absorption, was subsequently re-deposited in it, through the mucus secreted from the blood, is a question of no practical importance in relation to the cause of death, or the criminality of the person administering the poison. It is an hypothesis not merely improbable, but actually conflicting with facts already observed and recorded in reference to the dead human body.

The theory of *cadaveric imbibition* during the long period of interment, would not affect the cause of death, or the fact of administration during life. It starts with the supposition that the poison is *in* the stomach. There is nothing in the facts of the case to lead to the suggestion that Palmer or Bradshaw the nurse, who alone were present at the death of the deceased, then, for no conceivable motive, took an opportunity of injecting some ounces of a solution of tartarized antimony into the deceased's stomach, or rectum, or both. This is the postulatum on which an objection has been taken to the usual inference,—that when antimony is found in the liver or other organs, it has been derived from absorption and deposition during life. But the rectum contained a larger quantity than the stomach, and the whole of the spleen lying in immediate contact with this organ, and therefore especially liable to imbibe the poison under this hypothesis, contained much less antimony than two ounces of the large lobe of the liver entirely removed from all contact with the stomach. The large quantity found in the bile, admits of no explanation on the cadaveric imbibition hypothesis.

It has been necessary to deal with these medical subtleties as they are just sufficient to produce some impression on the public mind, adversely to the conclusions drawn by witnesses in a particular case, when, as in this instance, they admit of no reasonable application, and are wholly inconsistent with the facts proved.

In respect to the conclusions drawn by Dr. Rees and myself, and appended to our report of the analysis in the case of Ann Palmer, I have only one or two remarks to offer (*ante*, p. 460). They were assailed at the time as not warranted by the facts, and, as it was alleged, on high medical authority. We treated this statement as a mere legal device, on the part of persons interested in the defence, for the purpose of obtaining from us materials for a cross-examination at the trial; and, except on one occasion, for the correction of some important misstatements, no notice was taken of them. The nnmerous facts connected with antimonial poisoning, as detailed by accurate and trustworthy authorities, furnish the best answer to the criticisms which appeared during a period of great public and

professional excitement. Every conclusion drawn by us has been borne out either by the evidence which was elicited subsequently to the publication of our report, or by the results of cases previously recorded. The paragraphs 1, 2, 3, are mere statements of facts (*ante*, p. 460). *Conclusion* 4th. That the antimony had been taken within a few hours of death, was based on the fact that, if taken at all, the antimony must have been taken in a soluble form. No powders were given to the deceased during her illness. From that which had fallen within our experience, we knew that antimony dissolved, was rapidly removed from the stomach by vomiting and other means. Three grains had entirely disappeared in twenty hours. Hence it became a question, for how long a time *liquids*, in a case in which there was frequent vomiting, would be likely to remain in the stomach. In our opinion, at the farthest not more than five or six hours had elapsed since she took some portion of antimony; but we left the period undetermined as we were bound to do. The 5th conclusion we considered was borne out by the fact that a larger amount of antimony, in a more extensive state of diffusion had been discovered in this body than in any case that we could find recorded. The medical men called in by Palmer did not prescribe it; it might have been administered by accident, in mistake for sugar in the tea, or salt in the gruel or broth; but then the accident must have been of daily occurrence, and there must have been a double mistake, since it is not likely that the same white powder, either regarded as sugar or salt, would have been used to sweeten or season such various liquids as tea, gruel, broth, and arrow-root. As the antimony was not prescribed by the medical men, and was given without their knowledge, it must have been *improperly* administered to her, but we accused no one. We left it quite open to be proved by evidence whether the administration was the result of ignorance or design. *Conclusion* 6th, is to the effect that one large dose would not account for the facts, but that several doses had been *taken* by deceased, at intervals several days before her death. The illness commenced on Thursday, September 21st, not, so far as can be ascertained, with great violence; there were not the symptoms of acute poisoning by tartarized antimony, there was no pain, spasms, cramps, bloody

vomiting, or purging. These symptoms would have appeared within a few hours after the supposed single large dose had been taken, and their existence must have been known to the servant. The deceased would either have recovered or have died before Sunday the 24th, the day on which Bamford was first sent for. The deceased could not have taken a large dose, either in solution or powder, without being conscious of it. She would most probably have communicated this fact to Bradshaw the nurse. In fact, unless suicide by tartarized antimony was suggested, for which hypothesis there was not the slightest pretence, it is impossible to admit from the evidence that only one dose was taken, and *that* on the Thursday morning, seven days before death. The repeated vomitings after taking tea, broth, and other bland liquids, which generally tend to allay them, and the discovery of soluble antimony in the contents of the stomach, are medical circumstances that point to repeated doses; and they admit of a reasonable explanation only on this assumption. This conclusion does not affect the question of criminal administration, for whether the poison be given in one dose or in several doses, is quite immaterial if given with intent to kill! It might have been suggested that Bamford had made a mistake in the medicine, and instead of one drachm of tartrate of potash prepared by him, in the draught, that he had unknowingly substituted tartarized antimony. This suggestion, however, could not be admitted; the symptoms showed that deceased had already taken antimony for at least three days before Bamford saw her. When he saw her, she was suffering from the effects of antimonial poisoning in a severe form; in fact, she was then sinking. It was proved at the inquest that in Bamford's shop tartarized antimony and tartrate of potash were kept in different bottles and in places remote from each other. He was ordered to make up a similar draught, and having already prepared one by substitution of tartarized antimony, the colour, taste, and appearance were found to be widely different. A large portion of the tartarized antimony in the imitated draught remained as a white sediment at the bottom.

Conclusion 7 is to the effect that the metallic antimony found in the body justified the inference that tartarized antimony was taken by deceased. The antimonial preparation

was in a soluble form in the stomach, duodenum, and rectum. The filtered aqueous solution gave readily indications of antimony. It could, therefore, be only the chloride or the compound which we named. The chloride of antimony could not have been taken, since, apart from the violent local irritation which it would have immediately produced in the act of swallowing, there would have been marks of its corrosive action on the mouth and throat, as well as in the gullet and œsophagus. It could not have reached the rectum in the form in which we found antimony there, and this bowel presented no appearance of its having been injected. Further, the deceased could not possibly have taken it without being aware of it, and it could not have been administered to her by mistake in any liquid. The supposition of the use of the chloride, involved, of necessity, the conclusion either that the deceased committed suicide, or that she was consciously accessory to the taking of the poison.

The medicinal use of antimonial, or James's powder, was also suggested as a means by which the antimony might have found its way into her body; but this would leave unexplained the symptoms and the presence of a notable quantity of soluble antimony in the stomach and intestinal canal. No powder was prescribed for, or taken by, the deceased, during the whole period of her illness, and it is not probable that this powder, which is not an active poison, would have been secretly administered in gruel, tea, &c., either for medicinal purposes, or with criminal intention.

The conclusions 8 and 9 require no observation; they explain themselves.

Assuming that the foregoing facts and remarks satisfactorily prove that Ann Palmer died from the effects of tartarized antimony, and not from any natural disease; and further, that this preparation was not taken by any accident, or with a view to the commission of suicide, the question arises—Who administered this poison to her? The only persons who were about her during her illness, were William Palmer the husband, the female servant, and the nurse Bradshaw, who attended her, as it is assumed, only after the administration of the antimony had actually commenced, and had already produced serious effects.

The same observation may be made respecting Dr. Knight, Mr. Bamford, and Thirlby, Palmer's assistant. It is clear, therefore, assuming the vomiting to have commenced on Thursday, the 21st Sept., that the female servant and Palmer were the only two who had the opportunity of administering the poison to the deceased. Against the female servant there could be no reasonable ground of suspicion. She had been in the service nine months; there was no evidence that she had been on bad terms with her mistress; there was no apparent *motive*; and although, as she prepared most of the liquid articles of food for her mistress during her illness, and therefore had the *opportunity* of administering poison, there was not the least evidence that she ever had the *means*. It is a circumstance too, worthy of remark, that the tea which she made for her mistress on the night of her arrival from Liverpool, Wednesday the 20th September, before Palmer had entered the house, produced no ill effects. It was only when Palmer took to his wife the liquids prepared by the servant, *e. g.*, tea on the morning of the 21st, and other liquids daily, including some broth prepared by himself during her illness; that the nausea, retching, and vomiting appeared. He had, therefore, the *opportunity* of administering poison; as a medical man possessing the drug, (which was found by Dr. Monckton in his surgery,) he had the *means*; and it is suggested that he had a powerful *motive*.

His conduct in invariably taking every article of food from the servant, and conveying it to his wife, during the whole period of her illness, might, it is true, receive another interpretation; it might be supposed to show the anxious attention of a devoted husband to a sick wife. On the other hand, this conduct is not consistent with the fact, that while the entries in his diary show that his wife was "ill in bed," he did not send for Mr. Bamford until the fourth day of her illness, and he did not consult Dr. Knight, a physician of repute and the guardian of his wife, until the fifth day of her illness, and then only upon the suggestion of Mr. Bamford. His diary then shows, day by day until her death, that his wife was "very ill in bed;" and although he promised to send immediately for Dr. Knight, if she did not improve, he allowed her to sink gradually, without either prescribing medicine himself or pro-

curing the medical assistance which was at hand. The two gentlemen who had been called in to see the deceased, saw her once only, pending an illness which, as a medical man, *he* (Palmer) must have known was rapidly carrying her to the grave. The only medicine which he appears to have given to her consisted in some effervescing powders advised by Dr. Knight to allay the sickness. With the single exception of two pills and a draught, Bamford's medicine and advice were disregarded. To Mr. Bamford he stated that deceased was labouring under constipation of the bowels; to Dr. Knight, that she had caught the cholera at Liverpool, and had come home ill; statements proved by the evidence to be inconsistent and untrue. It has been suggested that Palmer, as a medical man, might have privately given to his wife small doses of antimony, in the form of tartarized antimony, as a remedy for cholera! Had this supposed innocent mode of practice been really adopted, there was no reason why, when calling in Bamford and Knight, he did not communicate to them that he was giving this medicine to his wife. They would then have given the opinion which they have since expressed, namely, that it would have accounted for the nausea, retching, and vomiting, which were exhausting the deceased, and that it must immediately be withdrawn. The concealment of such an important fact as this by a medical man well acquainted, professionally, with the properties of the drug, would of course lay his motives for secret administration open to another explanation; namely, that his design was *criminal*, and that his intention in giving the antimony to his wife—not openly as medicine, for she took none prescribed by him—but secretly, in every article of food in which medicines of this nature are not commonly administered, could have been only that of destroying her by poison, under circumstances which, as he then thought, might never be brought to light.

On the question of *motive*, but little need here be said. Palmer was a gambler in life-insurance. With an actual life interest in his wife's property to the extent of only £3000, and within the short period of nine months of her death, he made, or caused to be made, proposals for insuring her life in eight different Offices for an aggregate sum of £33,000! Three proposals, made individually by *himself* to the Norwich Union in December, 1853, for £3000; to the Scottish Equi-

table in January, 1854, for £5000; and to the Sun, in February, 1854, also for £5000, were accepted by these offices, thus making a total insurance of £13,000 to cover a life interest of £3000 on his wife's property, effected in less than three months! The other proposals to the amount of £20,000 were declined by the Offices.[1] Within little more than six months afterwards, the wife died from poison, under his immediate superintendence and care! These large sums were claimed by him, and paid by the offices, after the death of his wife. I am informed that there was great suspicion at the time that there had been foul play; but the general respectability of Palmer, his social and professional position, taken together with the two medical certificates of the cause of the death of the wife, checked any intention which might have existed to resist the payment of the policies. As in the case of most criminals who have succeeded in the perpetration of one act of murder poison, he was, however, led to the perpetration of another by when an equally urgent necessity arose to dispose of a victim, and it was the murder of Cook by strychnia, in 1855, which led to the detection of the murder of the wife in the previous year.

[1] The total premiums paid by Palmer on the three policies amounted to £388; and for the payment of these, he drew a bill which was actually discounted on the security of the policies, so that by this proceeding he contrived to make the policies pay for themselves. As he was in embarrassed circumstances, and unable to meet bills of this kind without becoming further involved, the realisation of the policies, by the death of his wife, became to him a kind of necessity. Our "professional brother," as the 'Association Medical Journal' called him, went a little further than this. Having no interest whatever in the life of his brother, WALTER PALMER, he either made, or induced him to make, proposals for the insurance of his life in various Offices to the extent of £82,000! The Prince of Wales Office accepted the proposals to the extent of £13,000, under certain limitations. On the 16th August, 1855, Walter Palmer died suddenly, under circumstances of very great suspicion, in the presence of his brother and another man, with whom he had placed him as a lodger! The policy had been previously assigned by Walter to William for a nominal consideration; but when William Palmer made application for the amount, the Office refused payment. He subsequently tried, but ineffectually, to insure, to the extent of £25,000, the life of *his groom*, George Bates, described as "a gentleman" of independent means; and advised Cheshire, the post-master of Rugeley, to make proposals on his life to the extent of £5000! Thuggism, as perpetrated by the Hindoos, must be regarded as a venial offence compared with this professional mode of raising large sums of money upon human life. Yet there were those in the professions of law and medicine who, by a distortion of facts and perversion of science, endeavoured to turn loose upon society one of the greatest criminals that ever trod the earth!

Table of Recent Cases of Poisoning by the Criminal Administration of Tartarized Antimony.

No.	Name and date.	Dose and symptoms.	Result and appearances.	Analysis.
1	Ann Palmer, æt. 27, Sept., 1854. (Inquest at Rugeley, January, 1856.)	Administered in repeated doses. Quantity taken unknown. Nausea; vomiting; soreness of throat; vomited matter white, and afterwards bilious; great exhaustion and depression, but little pain or purging.	Death on the eighth day. Appearances fifteen months after death: Parts well preserved; slight patches of redness in stomach; viscera generally healthy.	Antimony found, by processes of Reinsch and Marsh, in all parts examined. About four grains, one half (absorbed) in the liver and soft organs, the remainder chiefly in stomach and rectum.
2	John Parsons Cook, æt. 28, November, 1855. (Trial for murder, Central Criminal Court, May, 1856.)	Administered in repeated doses. Quantity taken unknown. Vomiting repeatedly after taking liquids; purging as the result of medicine.	Death on the sixth day, from a dose of strychnia. Heart empty; blood liquid; patches of redness on the mucous membrane of the stomach and intestines.	Antimony found in coats of stomach and coats and contents of intestines. (Contents of stomach lost.) Antimony found in blood, liver, left kidney, and spleen. Quantity estimated at half a grain.
3	Daniel M'Mullen, æt. 40, June, 1856. (Trial for murder, Liverpool Summer Assizes, 1856.)	Administered in repeated doses, at intervals during a period of three months. Quantity taken unknown. Vomiting and burning pain in stomach after taking food; emaciation; sickness; pain in stomach,	Death in ten days after last severe attack. Body emaciated; stomach and duodenum much inflamed; patches of inflammation in small intestines, also in rectum; liver and one kidney congested; throat	Antimony found chiefly in liver, in one of the kidneys, and in the hard fæces. It was also detected in the urine, and only indistinctly in the blood and contents of stomach. There was a faint indication in the

		like pricking of pins; great prostration of strength; thirst; sallowness of skin, increasing to jaundice; difficulty of breathing; pain on pressure over stomach, not over bowels; gradual sinking; no diarrhœa, but some constipation; no cramps; no constriction of throat, or difficulty of swallowing.	inflamed; lungs slightly emphysematous; right lung congested.	heart, lungs, and rectum. The total quantity found amounted to less than two grains.
4	Ann Freeman (adult), Jan., 1857. (Trial for administering with intent to murder, Drogheda Spring Assizes, 1857.)	Administered, in repeated doses, in articles of food. Quantity taken unknown; burning sensation in stomach; nausea; speedy vomiting and purging; increased flow of saliva; symptoms of gastritis, but accompanied by purging.	Recovery after free vomiting and purging.	Antimony detected as tartar emetic in the vomited matters. About nine grains found.
5	Ellen Hardman (adult), Feb., 1857. (Trial for murder, Lancaster Summer Assizes, Aug., 1857.)	Administered in repeated doses. Quantity taken unknown. Quantity purchased sixty grains. Vomiting; purging; pain in stomach and bowels; frequent retching; vomited matter bilious; headache; restlessness; dryness of throat; great prostration of strength; cold clammy perspiration; pulselessness.	Death in nine days. Body examined fifteen days after death. Parts well preserved; inflammation of lower part of œsophagus; stomach and intestines inflamed in patches, especially duodenum and rectum; blood liquid and dark coloured; heart empty; slight congestion of one lung.	Antimony found in stomach, duodenum, and rectum, in liver, and other organs, altogether not more than from half to three quarters of a grain. In the liver and duodenum combined the one two-hundredth of a grain of arsenic.[1] Arsenic found with antimony in no other part.

[1] The arsenic was considered by Mr. Watson to be probably due to impurity in tartar emetic. The same isolated discovery of minute traces of arsenic was made by Dr. Rees and myself in the analysis of the stomach of Ann Palmer (*ante*, p. 460). Some members of the "faculty" concerned for the defence in Palmer's case, affirmed that arsenic, if really present in the body of Ann Palmer, ought to have been found everywhere with antimony, or not found at all! It is singular that another murder by antimony should have so soon corroborated our result. "Quand l'homme dit que telle chose est, et la Nature dit que telle chose n'est pas, il faut en croire la Nature."

Among the five cases in the above table, three proved fatal, from the effects of repeated doses of antimony. In none of these could it be ascertained what quantity of poison was given in a dose, or altogether; but in No. 3, (Hardman), the quantity purchased by the criminal, about the date of the poisoning, was proved to have been sixty grains. This case, on which I attended as a witness, is further of interest from the fact, that the quantity of antimony found in the dead body was not greater than that found by Dr. Rees and myself in our analysis in the case of Cook; namely, about *half a grain.* The evidence was conclusive that the woman had died from tartarized antimony administered to her by her husband in small doses at intervals. The prisoner was convicted, and before his execution at Lancaster on the 29th September, 1857, he admitted that he had thus destroyed his wife. This case perhaps furnishes the best comment which can be offered on some of the preposterous statements put forward under quasi-medical authority by the defenders of Palmer—to the effect that no person can be poisoned by antimony in medicinal doses—that if a chemical analysis reveals the presence of only half a grain in a dead body, the person could not have died from poison, and that any medical opinion to this effect would be unjustifiable!

Lastly, the confession of this wretched criminal, the imitator of Palmer's crime, that he really poisoned his wife, shows that the detection of a quantity of antimony in a dead body sufficient to constitute a fatal dose, is *not* a necessary part of the proof of murder. Had it been made so in this instance, on the erroneous grounds allowed to be assumed by the learned counsel in the defence of Palmer, it is certain that this confessed murderer (Hardman) would have been acquitted; and that any criminal who hereafter selected this poison for the purpose of destroying life, might have easily succeeded in setting the law at defiance.

The object of this paper will have been fully attained, if it only has the effect of opening the eyes of the medical men who are not much occupied in medico-legal pursuits, to the great danger of certain dogmas now afloat regarding poisons and the medical proofs of the crime of poisoning.

The safety of society, and the due administration of public justice, demand from every member of the profession, in so far as it lies in his power, the exposure of fallacious medical doctrines, whether they are put forward to save the life of a wealthy criminal, or to lead to the conviction of one who may not have the means to provide for his defence. An error in legal medicine is like a two edged weapon; it cannot be employed to procure the acquittal of a really guilty man, without, on some other occasion, placing in jeopardy the life of one who is really innocent.

ON THE DETECTION

OF

ABSORBED STRYCHNIA AND OTHER POISONS.

By ALFRED S. TAYLOR, M.D. F.R.S.

In a paper on 'Poisoning by Strychnia,' published in the last number of these 'Reports,' I entered into an examination of various questions concerning which much difference of opinion existed among medical men. Among the questions propounded were these: 1. Could strychnia be infallibly detected in the tissues of the body as a result of its absorption and deposition in *all* cases in which it had destroyed life? 2. Can a person die from poison, speaking generally, and no poison be found either in the stomach or in an absorbed state in the tissues, after death? 3. Do poisons, when absorbed and carried into the blood, undergo chemical changes, owing to which their presence can no longer be recognised by the usual chemical tests? 4. Can we place confidence in the employment of colour-tests for the detection of the alkaloids in a dead body, in the absence of any corroborative evidence, *e. g.*, crystalline form, taste, action of reagents?

The discrepancy in the views of the chemical witnesses, at the trial of Palmer, regarding the answers to these questions, was a subject of public remark, and certainly for a time reflected discredit on professional evidence. Any facts which can explain or reconcile apparent discrepancies on subjects of such importance, cannot fail to be of service to those medical practitioners who may be called upon to give evidence in future

trials for poisoning. Some cases have recently occurred which may aid us in the consideration of these questions.

1. *As to the detection of absorbed strychnia.*—The particulars of the following case of suicide by strychnia were communicated to me by Mr. E. P. Wilkins, of Newport, in the Isle of Wight. On the 17th of February, 1857, a gentleman, æt. 23, took three grains of strychnia on a biscuit, at 10 o'clock, p.m. At a quarter before 11 o'clock, he was heard in his room bellowing or groaning. He was soon afterwards seen by Mr. Wilkins, who, in company with another surgeon, Mr. Tuttiett, remained with him until he died at 4 o'clock the following morning, thus making the whole duration of the case *six hours*, the symptoms having commenced in from half an hour to three quarters of an hour after the poison was taken. It appears that when the room was entered, he was found in tetanic convulsions. On his arrival, Mr. Wilkins noticed that the patient was suffering from tetanic convulsions, which occurred in paroxysms at an average interval of about an hour. These were attended with congestion of the face. Sudden shocks, as if electric, occurred in the intervening periods. These shocks came on either spontaneously, or on any attempt by the patient to speak, drink or move. The slightest touch, or even movement near him, was sufficient to produce them. Just as the paroxysms came on, he gasped convulsively to be held. The convulsions affected the whole muscular system, and at the onset were so violent as to jerk him off the bed to the floor. He retained perfect consciousness, and between the paroxysms, the patient was able to hold short conversations. The pupils were dilated, and during the convulsions it seemed as if his eyes would start from their sockets. He was bathed in a profuse perspiration, especially after the paroxysms. His back was arched, the head thrown backwards, the neck twisted, the chin elevated, the fingers clenched (not, however, very forcibly), the feet were arched, and the toes inverted. He requested several times to be turned over. When asked to open his mouth, he made the attempt with difficulty, as the jaws were convulsively (tightly) closed. The pulse was 150. The patient spoke in gasps, and said he was afraid he had not taken enough strychnia. When liquids were given to him,

the consequent convulsive movements rendered it difficult for him to swallow; and after remaining in the stomach a short time, the liquid was convulsively ejected in jerks. The arms were bent at the elbow, and the legs stretched out; there was no froth issuing from the mouth; the twitchings of the face resembled those of epilepsy; the heart continued to beat after the cessation of respiration; the pulse gradually became more and more feeble and ceased to beat at 4 a.m.

In the treatment, emetics of suphate of zinc were given, but these did not produce vomiting. An attempt to use the stomach-pump failed, by reason of the jaws being firmly closed by spasm. Slight vomiting was induced by tickling the throat with a feather.

Inspection.—Seven hours after death, the body was in the following condition. The rigidity was so great, as to allow the body to be lifted by the heels; it is described by Mr. Wilkins as being as stiff as wood: all the muscles were firmly contracted. The surface was congested (livid). An inspection was made thirty-six hours after death: the rigidity of the muscles had diminished, except in the fingers, in which it was more strongly developed than on the previous examination. In the chest, the lungs were congested; the heart was flabby, the cavities on the right side contained dark-coloured blood, in part fluid and in part coagulated. The fluid or liquid portion of the blood presented the remarkable appearance of being full of air-bubbles.[1] The contents of the abdomen presented no remarkable feature, except old adhesions of the omentum to the anterior walls. The kidneys were congested: the intestines were distended with gas, as they were before death. On opening the skull, the dura mater was observed to be much congested, as well as the pia mater at the upper and back part of the right hemisphere of the brain. On cutting into the substance of the brain, which was not softened, the bloody points were large and numerous. The ventricles contained much serum, and the plexus choroides were turgid and of a dusky colour. The upper part of the spinal cord was very vascular superficially, and the canal appeared to be full of serum. The scalp was charged with blood.

[1] This condition of the blood has been observed in another case of poisoning by strychnia.

Analysis.—Portions of the viscera and a small quantity of blood taken from the body of deceased, were forwarded to the late Dr. Marshall Hall; but as that gentleman was too ill to make a scientific investigation, he sent them to me, by Mr. Wilkins's request. The parts received by me for analysis were —1. The stomach, well secured by ligatures at both ends; 2. The heart, its cavities cut open and drained of blood; 3. The right kidney; 4. Portions of the liver and lungs; 5. A quantity of coagulated blood.

Considering the case to be one of great scientific importance, I sent portions of the viscera to gentlemen well known as trustworthy analysts and skilled toxicologists. Portions of the liver and lung were sent to Dr. Christison and Dr. Maclagan, of Edinburgh, and the kidney was sent to Dr. Geoghegan, Professor of Medical Jurisprudence in the Royal College of Surgeons, in Dublin. These gentlemen were simply informed, that the viscera had been taken from the body of a gentleman who had died in six hours from a dose of strychnia, and they were requested to adopt any process which they considered adequate for the detection of absorbed strychnia, and to inform me of the result. I had the assistance of Mr. M. Scanlan, a chemist of good experience on the properties of the organic alkaloids.

Appearances.—The mucous membrane of the stomach was highly rugose, and of a dark, brownish-red colour. At the cardiac end there was a red patch from congestion, covering about three square inches of the mucous surface. When the contents were removed, there was noticed a generally diffused redness of the lining membrane. This amounted to a deep lividity about the cardiac extremity, and also near the pylorus. The redness was strongly marked in patches; the coats of the stomach were thinned; the mucous membrane was softened, and easily removed by scraping; there was no ulceration, and no effusion of blood, but a thick layer of mucus adhered to the lining membrane. The *contents* of the stomach were of a light, reddish-brown colour. They were very liquid, and contained a curdy-looking substance, with much mucus floating in them. They amounted to about seven fluid ounces. The liquid had an acid reaction; when a portion was warmed, the red colour was destroyed, and a brown coagulum was produced.

This rendered it probable, that the reddish colour of the contents was owing to a slight admixture of blood.

The liver, kidney, and lung, presented no appearance of a morbid kind. The blood was very dark coloured.

The coats of the stomach, finely cut up with the contents, were treated by the process recommended by Stas, Otto, and Flandin. Alcohol with a vegetable acid (tartaric) was employed, and an acid alcoholic extract was thus procured, which after successive digestions in alcohol and water, and a reduction in bulk by evaporation at a low temperature, yielded a small quantity of liquid, having only a doubtfully bitter taste. On neutralizing this liquid with potash, and agitating it with ether, the ether left by evaporation, a slight pseudo-crystalline residue, in spots, on a watch-glass. When these spots were treated with sulphuric acid and a crystal of bichromate of potash, a fleeting purple and violet colour appeared, passing rapidly to a light red hue. We considered that the result would not represent more than the two hundredth of a grain of strychnia.

The whole of the heart, very finely cut up, was treated in a similar way. Concentrated alcoholic, ethereal, and aqueous solutions of this organ had *no bitter taste* whatever. The ethereal liquid obtained from the concentrated aqueous extract neutralized, left no crystalline residue perceptible under a good microscope; and sulphuric acid with the bichromate of potash, gave not the slightest indication of the colours which are presumed to characterise strychnia.

The blood sent for analysis amounted to two ounces and a half. It was treated by Stas's process, acetic acid being used for the solution of the strychnia, in place of the tartaric. The ethereal liquid obtained left no crystalline residue. The interior of the watch-glass in which it had been spontaneously evaporated, was tested by a small quantity of sulphuric acid, followed by the bichromate of potash and black oxide of manganese. There was no change of colour, nor any appearance to indicate the presence of strychnia. When 1-500th of a grain of strychnia was added, the purple and violet colours were immediately produced.

I received the subjoined letter from Dr. Douglas Maclagan,

in reference to the results of the analysis of the portions of liver and lung, made by himself and Dr. Christison:

28, *Heriot Row, Edinburgh,*
31*st March*, 1857.

My dear Dr. Taylor,—I have undertaken, in the name of Dr. Christison and myself, to report to you the result of our examination of the portion of liver and lung from your strychnia case which you sent to us. The result is, in one word, wholly negative. We worked by Stas's method. Everything went smoothly with the manipulations, and eventually, not only did the bichromate of potash test fail to give any reaction of strychnia, but in no stage of the process, alcoholic, watery or ethereal, was there the faintest trace of bitterness. On applying the bichromate test to the product from the liver, there was the faintest trace of a dull red colour observed. This was, doubtless, owing to a trace of organic matter, which the ether had taken up. There was not a trace of purple, and the red was of the faintest shade. The *absence of bitterness* I hold to be not the least conclusive part of these experiments when working with a coloured material like bichromate of potash, and when bringing SO_3 into contact with infinitesimal traces of organic matter, there may be traces of some kind of tint developed which may deceive the optic nerve, but there is nothing to deceive the gustatory nerve, and I feel pretty sure that when strychnia cannot be *tasted* it will not readily be *tested*.

Taking the present experiments in conjunction with those which Dr. Christison and I made on the rabbits, I for one am quite satisfied that your proposition has been established, viz., that strychnia may prove rapidly fatal; that it may in such a case be found in the stomach; but that it would not be detectable at all in the tissues of the body.

Believe me, yours truly,
Douglas Maclagan.

Dr. Taylor.

The following is an extract from a letter received from Dr. Geoghegan, of Dublin, containing the results of his investigation:

"I have just concluded the examination of the kidney, which I have examined by Stas's method (oxalic acid being used) with the utmost care. There was not a vestige of strychnia, although a molecule of strychnia introduced, struck a vivid purple. So much for invisible strychnia!

"T. G. Geoghegan."

It will be perceived that this case in the *human subject* was very favorable for testing the accuracy of statements made by some of the chemists retained for the defence at the trial of Palmer, not from any experience in the human subject but from experiments on dogs and rabbits. It was contended by them, that the poison went into the body, and remained there

unchanged; that it must *always* be found, if a proper process be pursued; and that it is deposited in the tissues, and can invariably be detected there, if the person really died from its effects. The strychnia taken by the deceased, in the case above related, was of the average purity. A portion of the sample was sent to me by Mr. Wilkins, and I found it to contain only a trace of brucia. The quantity taken was three grains in the solid state, and the man lived six hours. There was here, therefore, ample time for absorption, diffusion, and deposition. What had become of the strychnia? Three grains could not have been entirely eliminated and carried off in the urine in three hours; the slight vomiting could not have removed it so completely from the stomach, that this organ, with its contents, would not have retained at the time of death more than the 1-200th of a grain—a quantity which it would not be safe to swear to in a Court of law, when the issue was one of life and death. It was certainly not deposited in the organs, or it would have been discovered in the heart, lungs, kidney, or blood. None of the liquids obtained from these organs had any perceptible *bitterness* to the taste, while strychnia gives a distinct bitterness in the proportion of 1-30,000th part, and even less. That the tests were working properly was proved by the fact, that when they failed to show strychnia, a minute portion of the sample of strychnia taken by the deceased, was added; the liquids then had a bitterness which they did not previously possess, and the colours indicative of strychnia immediately appeared.

The process here pursued for the extraction of strychnia is that which, after various trials, has been recommended as preferable to all others. Drs. Christison and Douglas Maclagan have found it adequate to detect strychnia in the stomach of a rabbit killed by a quarter of a grain. I have also found that the process enabled me to detect traces of the alkaloid in a rabbit poisoned by an equally small dose [1] Mr. Herapath and Dr. Letheby relied upon this process as the best method known for discovering absorbed strychnia in the minutest quantity. In fact, Dr. Letheby asserted, that having poisoned an animal with *half a grain*, and allowed the body to decompose for a month, he was enabled to recover the whole

[1] 'Guy's Hospital Reports,' October, 1856, pp. 382-84.

of the strychnia from the dead body within a small fraction of the dose given! After this, Stas's process cannot be impeached for want of delicacy. But it is perfectly clear that no process, however delicate, can make up for the absence of a poison; and whatever may be the result of colour-tests, strychnia cannot be present, nor sworn to as such, when bitterness of taste is not perceptible. I agree with Dr. Maclagan in thinking, from the peculiar intensity and permanence of the strychnia-bitter, that the tongue is not so likely to be deceived as the eye; and unless we obtain corroboration by the taste, as well as by the demonstration of other unequivocal characters, we may be led into a gross fallacy, and mistake organic matter for strychnia.[1]

Dr. de Vry, of Rotterdam, who was at Guy's Hospital in the early part of the year, communicated to me some interesting facts on this question. In September, 1856, he was ordered to make a chemical analysis in the case of a man who was suspected to have died from poison. The man was brought to the Rotterdam Hospital in a tetanic state; and owing to the symptoms under which he died, a search was made for strychnia, but neither this nor any other poison could be found in the body, so that the death of the man remained unexplained. This led to the serious question: Does a negative

[1] A process by chloroform originally suggested by M. Rabourdin has been appropriated by an English chemist, who was one of the witnesses for the defence at Palmer's trial. There is not the slightest proof that it possesses any advantage over that of Stas. Assuming that it will enable a chemist to detect smaller quantities of strychnia, this is no recommendation. Stas's process will detect a quantity so small, that a conscientious witness might fairly shrink from absolutely relying upon it, when the result of his reliance might be the conviction and execution of a person charged with murder. What jury having common sense would believe the statement of a man who absolutely relied upon *one* test, to swear to the ten thousandth, or even the thousandth part of a grain of strychnia! Something more than a cat and dog experience is required to justify this sort of swearing. In a chemical laboratory, delicacy in testing may be sought for and relied on; if a mistake is made, either no harm is done, or the evil consequences fall on the operator. In a Court of law, however, it is not delicacy but *certainty* that is required: hence a mode of extracting and testing what is supposed to be strychnia, or any other poison which admits of *no reasonable method of corroboration*, is, to use the emphatic words of the late Lord Chief Justice Denman, a mockery, a delusion, and a snare. The fruits of this kind of rash confidence in testing for the alkaloids will be presently adverted to.

result, negative poisoning by strychnia. In order to solve this question, Dr. de Vry was led to perform many experiments on the tests for strychnia, and the best methods which are at present available for its detection. The conclusions at which he arrives in his paper are these:

1. That the method pursued for detecting strychnia was adapted to discover the least trace of the poison, for even only 1-60,000th of a grain could be detected.

2. That even when the strychnia is combined with albuminous matter, the whole quantity can be separated by the method of Stas, if properly conducted.

3. That if death has been caused by strychnia, this poison can be detected in the body provided it has been administered in a quantity *more than sufficient* to cause death.

4. That if the poisoning by strychnia has been chronic, and has resulted from a quantity not greater than is just necessary to cause death, the cause of death *cannot be proved* either by the post-mortem examination of the body or by a chemical investigation of the intestines.

5. That it appears to be highly probable that that part of the strychnia which acts mortally, is *decomposed* in the living body.

6. That the urine of patients who take strychnia or its salts as a medicine contains not a trace of this poison.[1]

It will be seen, that these conclusions arrived at by Dr. de Vry, and M. Van der Burg, his coadjutor, perfectly confirm the evidence of the witnesses for the Crown on the trial of Palmer. Living in a foreign country, and removed from anything like prejudice on either side, these gentlemen, by their testimony as to the non-discovery of free or absorbed strychnia in *all* cases of poisoning by this alkaloid, have contributed to remove a difficulty which had been converted into an opprobrium on medical evidence. It may suffice to state, that the analysis made by Drs. Christison, Maclagan, Geoghegan, and Mr. Scanlan and myself, in a clear case of poisoning by strychnia in the human body, show that a man may die in a few hours from a full dose of strychnia, that none of the absorbed poison may be found in his organs; and that, when the stomach is not tampered with, a small quantity of unabsorbed strychnia may be found in the contents. These facts place poisoning by strychnia in strict analogy with other modes of poisoning.

2. *Can a person die from poison, and no poison, either free or absorbed, be found in the body?*

[1] See, for a report of these experiments, 'Pharmaceutical Journal,' March, 1857, p. 451.

The case of the Rev. Dr. Alexander, of which the particulars have been communicated to me by Dr. Geoghegan, of Dublin, is of great interest in reference to this question. Dr. Alexander died in sixteen days, from the effects of arsenic, which had been accidentally mixed with some arrow-root of which he partook. At the inquiry which took place, Dr. Geoghegan stated that he had found a quantity of arsenic in the arrow-root: but he had been unable to discover a trace of the poison either in the contents of the stomach or in the viscera of the deceased. The viscera which he examined, were the liver, kidneys, part of the brain, and two pounds of fat. Taking into account the duration of the illness, such a result did not in his view militate against the presumption of death from poison. The character of the symptoms taken in all their bearings, together with the nature of the morbid appearances, and the presence of arsenic in the arrow-root, left no doubt that death was the result of arsenical poisoning.[1] This case strikingly bears out the statement of Orfila, that arsenic may be entirely eliminated from the body in from fourteen to sixteen days. It is remarkable, too, that for two days after the deceased had taken the poison, the urine was suppressed, so that this channel of elimination was stopped, and deposition in the organs was thus favoured.

In August, 1857, I was consulted respecting a case of alleged poisoning by opium, which was the subject of a trial for murder at the late Liverpool assizes. A child died under the usual symptoms of narcotic poisoning, and it was proved that the mother, who was charged with the murder, had procured from a druggist, on the day before the death, one hundred drops of laudanum. On inspection, there was congestion of the brain and its membranes, but no natural cause of death. Mr. Stone, of Manchester, made an analysis of the stomach and viscera. No morphia, the poisonous alkaloid of opium, was found anywhere: but from one result Mr. Stone was led to suspect the presence of meconic acid. He declined, however, to speak positively to this, or to state that the result unequivocally proved the presence of opium in the stomach. In this he took a very prudent and proper course.

[1] See, for an account of this case, the 'Medical Times and Gazette,' April 18, 1857, p. 389.

Although there could be no doubt from the medical facts that death was caused by opium, no morphia was detected in the body. This simply confirms that which experience has already established in other cases of narcotic poisoning.[1]

A strong attempt was made on the Palmer trial to instil into the public mind, as an undisputed and undeniable scientific fact, that poison always remained, and could always be detected in the dead body of a person who died from its effects; and if it were not found by proper chemical processes, the inference was that death could *not* have resulted from poisoning. Many facts showing the erroneousness of this proposition were published in the last number of these Reports. But when an attempt was made to procure the acquittal of Palmer on this fallacious ground, it is satisfactory to be able to adduce the evidence of Mr. Herapath at a recent trial for murder by

[1] It should be observed, that in this instance the stomach was unfortunately cut open by the medical man who made the inspection: and the contents, whatever they were, spilled over the intestines, in a jar in which the stomach was afterwards placed. It will be perceived that in this respect the case resembled that of Cook. There was, however, this difference in Cook's case. The murderer was present at the inspection: his friend and associate Newton, who only a week before had given him the strychnia, and on the night before had conversed with him on the possibility of discovering a grain in a dead body, assisted at the inspection! It was this associate who mangled the stomach, spilled its contents; and then, to put a climax to his proceedings, turned it inside out and threw it into the jar with the intestines. The defence-chemists swore that this mode of dealing with a stomach containing probably but a small quantity of an alkaloidal poison, would create no difficulty in finding it. It would, in their opinion, only occupy a little more time! Dr. Letheby's evidence on this point, as it bears equally on Mr. Stone's analysis in the laudanum case, is here deserving of quotation:

"*Mr. Kenealey.*—Supposing the contents were put into a jar and jumbled up with the intestines and a portion of the stomach, would that prevent the discovery of strychnia if the person had died of strychnia?

"*Dr. Letheby.—It would not.*"

As this witness had not made an analysis of a stomach so treated, his answer, given as it was without any qualification as to the quantity of poison, the state in which the poison was swallowed, the amount of vomiting, and the length of time which the person survived after taking it, must be regarded as a mere speculation, adapted as it stood to make the jury believe that the poison had *not* been taken by deceased, while the witness himself held the reserved opinion that the poison was there, but that which he considered the right process, had not been pursued for its detection!

There can be no doubt that this mode of dealing with a stomach in a case of suspected poisoning is the very best method of defeating a chemical investigation.

poison, in support of an opinion which was then described as novel, incorrect, and unsupported by facts. It was said that to teach people that a person might die from poison and no trace be found in the body, was a doctrine most dangerous to the security of life. Whatever danger there may be in promulgating the fact, it is quite certain that a greater danger must attend the suppression of truth, and the propagation of falsehood.

A trial took place at the last Bodmin Assizes (July, 1857), in which a man named Beard, was charged with the wilful murder of his grandchild, chiefly on the evidence of Mr. Herapath, by poisoning it with phosphorus. It was proved that the prisoner procured a pot of phosphorus-paste, as it is used for destroying vermin, on false pretences; and the evidence went to show that he had administered this paste on bread to the deceased, at various times. The child died on the fourth day of its illness, *i. e.* on the 5th of April, under such symptoms as phosphorus would produce. The body was buried on the 6th, and exhumed for inspection and analysis on the 29th. Mr. Herapath stated in his evidence at the trial, that he found the stomach highly inflamed and blistered, the membrane raised in small vesications. The duodenum was not inflamed but blistered. The remainder of the intestines were generally in a natural state, except that there was intussusception at one part. The lower part of the intestines was blistered. He referred death to irritant poison, and he considered that poison to be phosphorus. *He could not find any trace of it in the body.* In order to account for its absence, he made the following suggestion. "Assuming the child to have been poisoned by it, I say that phosphorus is constantly being destroyed by the action of the air, slowly burning and passing into phosphorous and phosphoric acids; and I should expect after the sickness, that the small quantity (?) of phosphorus which remained during a month's exposure in the grave, and in the opening of the stomach, would be changed into those acids." As these acids are not volatile, they would, if thus formed, *have remained in the liquids,* not to mention that phosphorus is known to chemists by a peculiar odour, even when existing in very small quantities. Hence it is to be inferred that the "best available means" were used by Mr. Herapath, and no

phosphorus, and no products of the decomposition of phosphorus, were found. There can be no doubt that if phosphorus was there, Mr. Herapath ought to have found it; but not being there, it would not be justifiable to infer that the child had not died from the effects of phosphorus, although such an inference might receive support from the chemical evidence given by Mr. Herapath and other chemists retained for the defence at the trial of Palmer. In fact, Mr. Herapath found it necessary at this trial to lay aside chemistry as altogether inadequate to solve the question, and to base his opinion on the symptoms and appearances of the body. The prisoner had not the benefit of what is termed a powerful defence, and Mr. Herapath's views and opinions, on this occasion, passed unquestioned.

We have, therefore, two cases during the past year, in which those easily detectable poisons, arsenic and phosphorus have caused death, but no trace of either poison could be detected in the dead body.

A few months since, Mr. Hilton consulted me on a case of poisoning, in which the facts proved that a quantity of solution of ammonia had been administered to a gentleman, with a view to rouse him from a fainting fit. The gentleman died in two days, from extensive inflammation affecting the larynx, trachea, and lungs; part of the poison having penetrated to these parts. The lower part of the œsophagus, and a large portion of the cardiac end of the stomach were softened, corroded, and destroyed. There was a blackening of the lining membrane, with effusion of blood in patches. The effects were undoubtedly due to the action of a corrosive and irritant poison like ammonia; but not the slightest trace of ammonia was present in any of the viscera of deceased.

3. On the third question propounded, as to the *changes undergone by a poison in the living body so as to remove it from the action of chemical tests*, no new facts have transpired, if we except Mr. Herapath's theory of the entire destruction of phosphorus in the stomach by oxidation, and the consequent impossibility of detecting this common and easily accessible poison or its *fixed products* in the blood, organs, and tissues of the body. In the case of poisoning by laudanum above related (*ante*, p. 491), the entire loss of morphia must be

ascribed either to vomiting, elimination, or decomposition in the body. The first and second conditions appear inadequate to account for its entire disappearance.

In the case of poisoning by strychnia recorded in this paper, three grains were taken, but not more than one two-hundredth of a grain remained in the contents of the stomach; there was none deposited in the viscera. What had become of the difference in the quantity of strychnia? Elimination in six hours would hardly account for it; but either this view must be adopted, or the alkaloid must undergo some change in the body.

It is a remarkable fact, too, in reference to this question, that those experimentalists who contend for the unchangeable nature of strychnia, have uniformly stated the dose given to an animal, but, setting aside Dr. Letheby's exceptional result, they have carefully avoided stating the quantity found in the dead body. Colour-tests do not give the quantity; hence there is a pure evasion of the important fact required to establish that strychnia is unchanged and unchangeable in the human organism; in no instance has the quantity found been proved to be equal to the quantity administered. On the other hand, owing to its rapid disappearance from the solids and fluids, it is probable that, as in the case of phosphorus and morphia, a portion at least may undergo changes, and be removed from the action of tests. What is true of one poison susceptible of oxidation, may be true of another.

4. *Can we place confidence in the employment of colour-tests for the detection of alkaloids in a dead body, in the absence of any corroborative evidence?*—Most persons will agree, that if a man is to be condemned to death on *chemical* evidence, that evidence should be conclusive and satisfactory to every reasonable mind. At the Palmer trial the effect of a strong reliance on colour-tests would have been to acquit, and not to convict the accused; hence the current of public opinion ran rather strongly in favour of an implicit and blind reliance on a mode of testing which, unless carefully watched, might certainly bring innocent persons to the scaffold. This popular feeling has had the unfortunate tendency to make some chemists strain their processes and tests to a degree positively dangerous

when the results are made the basis of medical evidence. At Palmer's trial the public appetite for colour-tests and microscopic testing was sustained by the very positive statements on oath, that an invisible quantity of a poison in a dead body admitted of certain and infallible detection. One witness spoke of his detecting by colour-tests the fifty-thousandth of a grain of strychnia; a second of his detecting the tenth part of a grain in any liquid; and a third (Mr. Rodgers) in still smaller proportion, for he speaks of the *two thousandth of a grain* being a large quantity. Mr. Rodgers seriously states, that "the operator must be careful not to expose the matter (strychnia) under examination to an intense light, as in his anxiety to watch the colour-changes he is apt to do, the effect of light in more than moderate amount being to suspend the chemical reactions!" This witness professes that he found strychnia deposited in the *bones* of an animal which died in three hours from taking, in divided doses, only *one sixth* of a grain of strychnia! Had he sought for the poison, he would no doubt have equally found it, or something that might have been mistaken for it, in the hair, nails, and teeth, in fact, in every situation in which he looked for it. "*Quod volumus facile credimus.*"[1] If this sort of evidence is worth anything, it is as available for a prosecution as for a defence; but where is the barrister who would trifle with the solemnity of a court of justice by producing evidence like this against a wretched prisoner on his trial for murder by poison! Chemical evidence which requires precautions of this refined kind to enable a man to judge of the action of tests, is no evidence at all. Such a method of dealing with processes for the detection of infinitesimal quantities of poison brings contempt upon science; and if received, might seriously compromise the character or life of an innocent person. The desire to satisfy the popular craving for the wonderful, and to acquire a temporary notoriety by bold pretensions, may sometimes betray men into these excesses; they want the courage to acknowledge that there are some problems in science which cannot at present be solved.

A recent case, which but for the acuteness of Mr. Norris Davey, of Romford, would probably not have been made known, shows the extreme danger of relying too strongly upon

[1] See a notice on Mr. J. E. D. Rodgers' Process for Strychnia, 'Medical Times and Gazette,' June 20th, 1857.

colour-tests for the alkaloidal poisons. A married woman, æt. 21, suffering from disease of the heart, took, on the 22d of July, 1857, some medicine prescribed for her by a medical practitioner. It appears that she took a pill and two doses of a mixture. On the morning of the 24th, she was found in bed, breathing uneasily, and she shortly afterwards expired. On an examination of the body, there was no appearance to account for death. The heart was empty and rather flabby, and the brain soft. The stomach and contents were sent to Dr. Letheby, in order to determine whether poison was the cause of death. Dr. Letheby attended at the inquest, and deposed—that the stomach "was much decomposed, and contained a small quantity of reddish gruel-like matter. *He had made a most careful chemical examination of this, and had found in it distinct traces of morphia; the quantity detected was about one tenth of a grain—equal to one grain of opium.* Such a quantity was insufficient to cause death, but did not represent the whole amount taken, as more must have been absorbed. In the absence of any other ascertained cause of death, he should conclude that the deceased *died from the effects of morphia or of opium.*"[1]

[It is not stated in the report whether absorbed morphia was or was not sought for in the organs to corroborate this result; but after the evidence given by this gentleman on Palmer's case, in reference to absorbed strychnia undergoing no change whatever in the blood, there appears no good reason why the liver and other organs which might, if necessary, have been obtained for this purpose, should not have been submitted to analysis.]

The opinion given at the inquest obviously led to one of two conclusions, *i. e.*, that the deceased had been either accidentally or intentionally poisoned, and the medicine, of which some fortunately remained, was then directed to be analysed. The prescriptions written by the medical practitioner were as follows:

℞ Pil. Galbani Comp., ʒiss;
Pil. Hydrargyri, gr. vj.
Divide in pil. xij. M.

[1] 'Medical Times and Gazette,' August 29th, 1857, p. 230.

℞ Sp. Æth. Sulph. Comp., ℥iss;
Extracti Taraxaci, ʒiss;
Acidi Nitrici diluti, ʒj;
Aquæ Camphoræ, ℥viij. M. ft. mist.

The following report from Dr. Letheby, in reference to the analysis of the medicine, was read at the adjourned inquest: "I do not find any trace of morphia or opium in either of them (the medicines); but I do find in the dark ethereal mixture a peculiar resinoid body, which exhibits *several of the reactions of morphia;* and this I am disposed to think is the matter which I found in the stomach. Having it in *larger quantity,* I can easily distinguish it from morphia, but where it occurs as *a trace* only in the contents of the stomach, *it is possible* that it was mistaken for that poison; I am glad to have made these examinations of the medicines, because the results will remove suspicion that might otherwise have attached to the case."

Let it be imagined, as Mr. Davey has suggested, that the residue of these medicines had not been forthcoming, then the allegation that morphia was present upon the infallible results of several chemical reactions could not have been disproved or disturbed; and the conclusion must have been, either that the druggist had introduced extract of opium by mistake for extract of taraxacum, or that some person about the deceased had administered poison to her.

The analysis was stated to have revealed, by "several reactions," a specified quantity—*one tenth of a grain* of morphia. This weight represents a visible quantity of crystals. These, if really obtained, could have been easily identified by their form and other well-marked characters. No resinoid body, whatever its peculiarities, could have formed an obstacle to an analyst who had made a most careful chemical examination. But it seems that a trace of resinoid manifested the reactions of the tenth of a grain of morphia, and a "larger quantity" was required to detect the fallacy. This is equal to asserting that the extract of taraxacum in mere traces may be mistaken for opium, and that although one alkaloid, strychnia, may be sworn to in tens of thousandths of grains, the alkaloid morphia cannot be safely recognised when it forms so much as the tenth part of a grain!

The whole secret of this discovery of poison where it did

not exist, may, however, be traced to a blind and rash reliance on the results of colour-testing, on reactions which can never be conclusive or satisfactory, when *the alkaloidal poison itself has not been bodily separated.* It must not, however, be allowed to go forth as an apology for this serious error, that the extract of taraxacum presents a source of fallacy in properly testing for morphia or opium.[1] When dissolved in water, the extract possesses a brown colour; it has a faintly bitter taste; and when diluted, is reddened or deepened in colour by nitric acid. These are the several reactions in which there is a very remote resemblance. The differences, however, are far more striking: no meconic acid can be obtained from it—no crystals resembling morphia in appearance and properties can be procured from it—and it contains sugar and tannic acid. In fact, taraxacin, which is the bitter principle, is wholly different from morphia in physical and chemical properties. The deceased, according to Mr. Davey, swallowed only twenty-two grains of the extract, and yet we are asked to suppose, in order to account for a serious chemical mistake, that this remained twenty-four hours unchanged in the stomach, and then gave such reactions, that the effects, under a most careful examination, could be confounded with those obtainable from the tenth of a grain of morphia!

Of all medico-legal errors, there is, perhaps, none so dangerous in its consequences as that of pronouncing a poison to be present when it is not. The assertion solemnly made on oath, and where the means of testing its accuracy are not, as in this case, forthcoming, may lead either to the conviction of an innocent person, or cast a shade for life on private character. Any efforts should be made to obviate such a serious contingency. The course is quite plain. In cases in which alkaloidal poisoning is alleged or suspected, the chemical evidence should not be allowed to rest upon a few reactions, but on the distinct isolation of the poison in a crystalline form, and the clear demonstration of some of its most salient characters. If, in arsenical poisoning, we require, for trustworthy evidence, that the arsenic should be separated in crystals, and the form

[1] Taraxacum, a source of fallacy in testing for Morphia, by N. F. Davey, 'Medical Times and Gazette,' August 29th, 1857, p. 230.

and chemical properties of these crystals clearly determined: it is obvious, that any evidence less than this should not be received in reference to organic poisons, the chemical characters of which are far more obscure, and, as in this case, are liable to be confounded with those of organic matters contained in a dead stomach. With this reasonable precaution, we need not fear that taraxacum, chicory, or any similar substance, may be mistaken for opium; but without it, there must always be a risk that the chemical inference is erroneous.

In the paper on 'Poisoning by Strychnia,' published in the last number of these 'Reports,' I mentioned cases (page 360) in which in one instance, veal-broth, and in another, the urine of a person who had not taken opium, had presented the reactions of morphia, and to these cases we have now to add "taraxacum," a medicine which may be frequently met with in mixtures and pills, as well as in the contents of a dead human stomach.

Every analyst is liable to error: the analyst who lays claim to infallibility in detecting substances is, probably from over-confidence, more prone than others to fall into a mistake; and when the error has a tendency to mislead the public and profession in future cases, it should be so exposed, that neither the interests of justice, nor those of medical science, should be damaged. As to the interests of justice, the husband might, in this case, but for the detection of the mistake, have brought an action against the druggist for poisoning his wife, or the husband, if any motive could have been suggested, might have been put on his trial for the murder of his wife. In reference to the interests of medical science, they require no defence from such spurious chemistry as this. When a proper mode of investigation is adopted, and a proper and safe mode of testing is employed, morphia and *meconic acid*, if present in a dead body in sufficient quantity, may be easily distinguished from taraxacum and all other medicinal substances. It is the reliance upon traces of organic matter, and over-confidence in the results of a mode of testing that admits of no corroboration, which is the *ignis fatuus* that lures to danger. We may be fully prepared, judging from the encouragement lately bestowed by the public upon analysts of

this class, that one or more cases will occur, in which persons may be wrongly charged with poisoning by strychnia, and the mistake only discovered, as on this occasion of alleged poisoning by opium, by some fortunate accident. If it be true in law that it is better ten guilty men should escape, than that one innocent man should suffer, it is equally true in legal medicine, that we should rather reject dubious evidence of the presence of poison in twenty cases, than pronounce that it is present in one case in which it clearly does not exist. The inevitable tendency of a contrary course is to destroy all confidence in the evidence furnished by chemistry. The advertising strychnia-finders content themselves in swearing by colour only, but here, an alkaloidal poison—morphia—is sworn to be present in a certain specified weight—a thousand times greater than is necessary for this homœopathic mode of testing—and yet the morphia exists only in the imagination of the analyst.

[Since the above was written, I have received from Mr. N. Davey a sample of the extract of taraxacum, used in the preparation of the medicine for the deceased. In conjunction with Mr. Scanlan, I have made a minute examination of it, and we find that with the exception of the coloured aqueous decoction being reddened by nitric acid, there is not a single point of resemblance between it and an infusion of opium. *It contains neither morphia nor meconic acid.* A quarter of a grain of opium contains a notable quantity of meconic acid: but in the case of the deceased, meconic acid was either not sought for, or judging by the chemical evidence, its absence was ignored.]

LIST

OF

GENTLEMEN EDUCATED AT GUY'S HOSPITAL

WHO HAVE PASSED THE

EXAMINATIONS OF THE SEVERAL UNIVERSITIES, COLLEGES, &c. &c.

Also those who have obtained the several appointments at Guy's, since September, 1856.

University of London.

DOCTOR OF MEDICINE.

William Tiffin Iliff, junr. . First Division.

SECOND EXAMINATION FOR BACHELOR OF MEDICINE, 1856.

* Thomas Edwin Burton Brown . . . . First Division.

* Obtained the Gold Medal in Physiology and Comparative Anatomy, and the Gold Medal in Surgery.

FIRST EXAMINATION FOR BACHELOR OF MEDICINE.

Alfred Edward Durham.
Henry Knaggs.
** Walter Moxon. } First Division.

Paul Henry Stokoe. . . Second Division.

** Exhibition and Gold Medal for Materia Medica. Gold Medal for Chemistry and fourth in Anatomy.

MATRICULATION EXAMINATION.

James Bankart.
James Beddard.
Frank Buszard.
John Cook.
*Charles Hilton Fagge.
John Henry Galton. } First Division.

Richard Jones. . . . Second Division.

* Obtained the Prize for Botany and was second in Chemistry.

University of St. Andrew's.

Thomas Alcock. | Sergeant J. C. Norman.

East India Company's Service.

BY EXAMINATION.

Andrew N. E. Riddell.

Royal College of Surgeons of England.

FELLOW BY EXAMINATION.

Charles F. Maunder.

MEMBERS.

SEPTEMBER, 1856.

William Mudd. | Charles Watson.

OCTOBER.

Samuel E. Richards.

DECEMBER.

James Proctor. | Osmer Barrett.

JANUARY, 1857.

FEBRUARY.

Benjamin Mason.
John Thomas Mackenzie.
George Henry Dyer.
Owen Tucker.

Joseph Orpe Brookhouse.
Pio Rengifo.
William Louis Le Sage.
Frederick Henry Smith.

MARCH.

William Podmore Jones.
Francis Davy.
Roger Duke.
Henry Cooper Biddle.
James John Beer.
Henry Knaggs.

Arthur Whitefield.
Arthur Ardagh.
William Langworthy Baker.
Joseph Hetherington.
Joseph Littlewood.
David Lloyd Roberts.

APRIL.

William Hodges.
Jonathan Brayton.
Astley Cooper.
John Edward Jones.
Samuel Prall.
William Smith.
Alexander M. M'Dougal.

MAY.

Richard Coles.
George Theophilus Jepson.

JUNE.

Frederick Stanway Gull.
Herbert James.
T. J. Trimnell.
William F. Dix.
F. F. M. Maynard.
David Shorter Skinner.
Charles Cyril Hicks.
Jonathan Brayton.
John Edwards Jones.
Robert Hicks.

JULY.

William Blasson.
James Stevenson.
Francis Carey.
Edmund H. Galton.

Licentiates in Midwifery.

John Elkington.
George H. Dyer.
Pio Rengifo.
Francis Scott.
Frederick H. Smith.
William L. Baker.
Francis J. Davy.
Joseph Hetherington.
W. Podmore Jones.
Henry Knaggs.
William Mudd.
George T. Jepson.
Jonathan Brayton.
John Edward Jones.
Alexander M. M'Dougal.
Samuel Prall.
Herbert James.
Henry C. Biddle.
Joseph Littlewood.
David S. Skinner.
Arthur Whitefield.
John Fluder.
Benjamin E. Mason.

Licentiates of the Apothecaries' Society.

NOVEMBER.

James Procter.

DECEMBER.

Charles Pigg.

FEBRUARY.

William Knaggs.
Astley Cooper.
Frederick Henry Smith.
Frederick Gull.

MARCH.

Charles Carver.
Frederick Reed.
Francis Griffiths.

APRIL.

Herbert Sedgwick Barnes.
Samuel Prall.
David Shorter Skinner.
William S. Granger.
Herbert James.
Henry Skaife.
William Lynes.
Charles Kelland.

MAY.

Albert Hind.
William Asslin.
Charles Hicks.
John E. Jones.
Henry Knaggs.
Francis T. Davy.
Arthur Whitefield.

JUNE.

William L. Baker.
Arthur D'Oyley Brooks.
Joseph Hetherington.

JULY.

Joseph P. Brookhouse.
Francis Carey.
Edmund H. Galton.

AUGUST.

Joseph Littlewood.
Jonathan Brayton.

GENTLEMEN WHO HAVE HELD THE APPOINTMENT OF HOUSE-SURGEON.

George W. Daniels.
Alexander M'Dougal.

GENTLEMEN TO WHOM DRESSERSHIPS HAVE BEEN AWARDED, SINCE OCTOBER.

David S. Skinner.
J. Edward Jones.
William L. Baker.
Arthur Whitefield.
Francis Carey.
Francis Scott.
Alexander M'Dougal.
Pio Rengifo.
James Broad.
Joseph P. Brookhouse.
Charles Kelland.
Osmer Barrett.
Henry C. Biddle.
Joseph Littlewood.
William S. Granger.
William Blasson.
Herbert Barnes.
James Stevenson.
Robert Innes Nisbett.
Edmund Heginbotham.
Samuel Prall.
Forster Maynard.
John Bowes.
Richard O. Olliver.

DRESSERS TO ASSISTANT-SURGEONS.

Richard W. Berkeley.
Joseph P. Brookhouse.

DRESSERS IN THE OPHTHALMIC WARDS.

Herbert Barnes.
Arthur D'Oyley Brooks.
Jonathan Brayton.
John Adcock.
George T. Jepson.
Charles Swaby Smith.
David S. Skinner.
John Edward Jones.
Joseph P. Brookhouse.
Alexander M. M'Dougal.
John Emptage Moore.
John Crew.

GENTLEMEN WHO FILLED THE OFFICE OF CLINICAL CLERK.

Winter Session, 1856-7.

A. Whitefield.
Pio Rengifo.
Henry C. Biddle.
Charles Kelland.
Alexander M'Dougal.
F. H. Galton.
James Stevenson.
William S. Granger.
Joseph Littlewood.
F. Maynard.
Samuel Prall.
William Smith.

Summer Session, 1857.

Francis Carey.
James Broad.
James E. Moore.
John M. Beaumont.
William Hodges.
John Bowes.

CLERKS APPOINTED TO CONDUCT THE INSPECTIONS.

James Stevenson.
Francis Carey.
John M. Beaumont.
John Rand.
Charles Swaby Smith.

PUPIL'S PHYSICAL SOCIETY'S PRIZE.

Richard W. Berkeley. | Thomas Joyce.

RESIDENT OBSTETRIC CLERKS.

September, 1856.

J. R. Skinner	Senior Clerk.
J. Bowes	Second Clerk.
A. Hind	Junior, 1st Fortnight.
T. Gwynne	Junior, 2d ditto.

October.

G. H. Dyer	Senior Clerk.
F. Scott	Second Clerk.
J. Brayton	Junior, 1st Fortnight.
J. Beaumont	Junior, 2d ditto.

November.

F. Scott	Senior Clerk.
R. W. Berkeley	Junior, 1st Fortnight.
C. S. Smith	Junior, 2d ditto.

December.

J. Bowes	Senior Clerk.
C. Williams	Junior, 1st Fortnight.
E. Worts	Junior, 2d ditto.

January, 1857.

J. Bowes	Senior Clerk.
G. T. Jepson	Second Clerk.

February.

G. T. Jepson	Senior Clerk.
W. F. Johnson	Second Clerk.

MARCH, 1856.

W. F. Johnson	Senior Clerk.
R. W. Berkeley	Second Clerk.

APRIL.

R. W. Berkeley	Senior Clerk.
F. J. Davy	Second Clerk.

MAY.

R. W. Berkeley	Senior Clerk.
J. P. Brookhouse	Second Clerk.

JUNE.

J. P. Brookhouse	Senior Clerk.
A. Whitefield	Second Clerk.

JULY.

A. Whitefield	Senior Clerk.
E. Worts	Second Clerk.

AUGUST.

E. Worts	Senior Clerk.
John M. Beaumont	Second Clerk.

NUMBER OF CASES OF LABOUR ATTENDED DURING 1856-7.

September, 1856	157
October ,,	156
November ,,	190
December ,,	189
January, 1857	171
February ,,	142
March ,,	168
April ,,	144
May ,,	163
June ,,	111
July ,,	127
August ,,	155
Total	1873

HONORARY OBSTETRIC CERTIFICATES

Awarded since October, 1856, for attending above 100 cases during Twelve Months.

Henry C. Biddle.
Joseph Littlewood.
George F. Farr.
Benjamin Simmons.
Thomas Gwynne.
John C. Gooding.
James Beer.
Pio Rengifo.
Richard W. Berkeley.
Alfred E. Eckroyd.
Edwin Worts.
John Bowes.

GUY'S.

1857-8.

THE MEDICAL SESSION

COMMENCES ON THE FIRST OF OCTOBER.

THE INTRODUCTORY ADDRESS will be given by Owen Rees, M.D., F.R.S., on Thursday, the First of October, at Two o'clock.

Gentlemen desirous of becoming Students must produce satisfactory testimony as to their Education and Conduct; they are required to pay £40 for the first year, £40 for the second year, and £10 for every succeeding year of attendance. One payment of £100 entitles a Student to a perpetual Ticket.

The Payment for the year admits to the Lectures, Practice, and all the privileges of a Student for that year only.

Clinical Clerks, Dressers, Ward Clerks, Dressers' Reporters, Obstetric Residents, and Dressers in the Eye Ward, are selected according to merit from those Students who have attended a second year, A Resident House-Surgeon is appointed every six months from those Students who have obtained the College Diploma.

Every Student is required to conform to the Rules and Regulations for the internal management of the Hospital.

The privileges of a Student will be withdrawn in the event of neglect or misconduct.

Certificates will not be given for Lectures, and Practice, unless duly attended.

The Christmas Recess commences December 24th. The Lectures are resumed January 6th. The Winter Session terminates March 31st. The Summer Course commences May 1st, and concludes July 31st.

MEDICAL OFFICERS.

Consulting Physician.—RICHARD BRIGHT, M.D., F.R.S.

Physicians.—THOMAS ADDISON, M.D.; G. H. BARLOW, M.D.; H. M. HUGHES, M.D.; OWEN REES, M.D., F.R.S.

Assistant Physicians.—W. W. GULL, M.D.; S. O. HABERSHON, M.D.; S. WILKS, M.D.

Surgeons.—Edward Cock, Esq.; J. Hilton, Esq., F.R.S.; J. Birkett, Esq.

Assistant Surgeons.—Alfred Poland, Esq.; J. Cooper Forster, Esq.; T. Bryant, Esq.

Obstetric Physicians.—J. C. W. Lever, M.D.; Henry Oldham, M.D.

Surgeon Dentist.—T. Bell, Esq., F.R.S. and Pres. L.S.; J. Salter, Esq.

Surgeon of the Eye Infirmary.—John F. France, Esq.

Apothecary.—James Stocker, Esq.

LECTURES, &c.

WINTER COURSES.

Medicine.—Dr. Owen Rees and Dr. Gull, Mondays, Wednesdays, and Fridays, at half-past three.

Clinical Medicine.—Dr. Addison, Dr. Barlow, Dr. Hughes, and Dr. Owen Rees.

Surgery.—Mr. Hilton and Mr. Birkett, Tuesdays, Thursdays, and Saturdays, at half-past three.

Clinical Surgery.—Mr. Cock, Mr. Hilton, and Mr. Birkett.

Anatomy, Descriptive and Surgical.—Mr. Poland and Mr. Cooper Forster, daily at nine.

Physiology and Microscopical Anatomy.—Dr. Pavy, Tuesdays, Thursdays, and Saturdays, at twelve.

Demonstrations on Anatomy.—Mr. Burton Brown, and Mr. Maunder, daily.

Demonstrations on Morbid Anatomy.—Dr. Wilks, daily, at half-past two.

Clinical Lectures on Midwifery and Diseases of Women.—Dr. Lever and Dr. Oldham.

Chemistry.—Dr. Alfred S. Taylor, Tuesdays, Thursdays, and Saturdays, at eleven.

Moral Philosophy.—The Rev. T. H. Bullock, M.A., Chaplain to the Hospital.

Dental Surgery.—Mr. Salter.

Experimental Philosophy.—Mr. Burton Brown, Wednesdays, at eleven.

SUMMER COURSES.

Demonstrations on Cutaneous Diseases.—Dr. Addison and Dr. Gull, Mondays, at one.

Materia Medica.—Dr. Habershon, Tuesdays, Thursdays, and Saturdays, at two.

Clinical Medicine.—Dr. Gull, Dr. Habershon, and Dr. Wilks.

Clinical Surgery.—Mr. Poland, Mr. J. Cooper Forster, and Mr. Bryant.

Midwifery.—Dr. Lever and Dr. Oldham, daily, at a quarter to nine.

Medical Jurisprudence.—Dr. Alfred S. Taylor, Tuesdays, Thursdays, and Saturdays, at ten.

Ophthalmic Surgery.—Mr. France, Wednesdays and Fridays, at three.

Pathology.—Dr. Wilks, Mondays, at twelve.

Comparative Anatomy.—Dr. Pavy, Wednesdays and Fridays, at twelve.

Botany.—Mr. Johnson, Tuesdays, Thursdays, and Saturdays, at half-past eleven.

Practical Chemistry.—Dr. Odling, Mondays, Wednesdays, and Fridays, ten to one.

Pupils' Physical Society.—Saturdays, at seven in the evening.

The Clinical Wards will open the first week in October and first week in May.

Lying-in Charity.—Dr. Lever and Dr. Oldham.

Curator of the Museum.—Dr. Wilks.

Mr. Burton Brown and Mr. Maunder will assist Pupils in their Studies.

THE LIBRARY, MUSEUMS, AND MODEL-ROOMS, ARE OPEN DAILY TO THE STUDENTS, FROM NINE O'CLOCK A.M., TILL FIVE O'CLOCK P.M.

Mr. Stocker, *Apothecary to Guy's Hospital, is authorized to enter the Names of Students.*

ASTLEY COOPER PRIZE.

The Sixth Triennial Prize of Three Hundred Pounds,

Under the Will of the late Sir Astley Cooper, Bart.,

WILL BE AWARDED TO

THE AUTHOR OF THE BEST ESSAY OR TREATISE

"ON THE STRUCTURE AND USE OF THE THYROID GLAND."

The Condition annexed by the Testator is, "That the Essays or "Treatises written for such Prize shall contain original experiments "and observations, which shall not have been previously published; "and that such Essays or Treatises shall (as far as the subject shall "admit of) be illustrated by preparations and drawings, which pre- "parations and drawings shall be added to the Museum of Guy's "Hospital, and shall, together with the Work itself, and the sole and "exclusive interest therein and the copyright thereof, become thence- "forth the property of the Hospital, and be transferred as such by "the successful candidate."

It is the will of the Founder that no Physician, or Surgeon, or other officer for the time being, of Guy's Hospital or of St. Thomas's Hospital, nor any person related by blood or affinity to any such Physician, or Surgeon, or other officer for the time being, shall at any time be entitled to claim the Prize; but, with the exception here referred to, this (the Astley Cooper) Prize is open for competition to the whole world.

Candidates are informed that their Essays, either written in the English Language, or, if in a Foreign Language, accompanied by an English translation, must be sent to Guy's Hospital on or before January 1st, 1859, addressed to the Physicians and Surgeons of Guy's Hospital.

Each Essay or Treatise must be distinguished by a Motto, and be accompanied by a sealed envelope containing the Name and Address of the writer. None of the envelopes will be opened, except that which accompanies the successful Treatise. The unsuccessful Essays or Treatises, with the illustrative preparations and drawings, will remain at the Museum of Guy's Hospital until claimed by the respective writers or their agents.

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